International Study of the Effectiveness of Environmental Assessment

FINAL REPORT

ENVIRONMENTAL ASSESSMENT IN A CHANGING WORLD:

Evaluating Practice to Improve Performance

Prepared by Barry Sadler

June 1996

Canadian Environmental Assessment Agency
Agence canadienne d'évaluation environnementale

IAIA International Association for Impact Assessment

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FOREWORD

In 1993, at the Shanghai meeting of the International Association for Impact Assessment (IAIA), the International Study of the Effectiveness of Environmental Assessment was launched. At that meeting, I asked the participants whether environmental assessment has achieved its goal of helping us reach better decisions. Three years later, I believe the answer to that question is a clear yes.

The study has examined the status of environmental assessment world-wide and has identified challenges for all of us in the future. The results, together with the many case studies, clearly demonstrate how environmental assessment is influencing and improving decision making. Environmental assessment has now become institutionalized in over 100 countries and is a standard practice in business.

Although the study was led by the Canadian Environmental Assessment Agency in collaboration with the IAIA, its success is the result of the many partners and contributors. I wish to express my great appreciation to all who contributed to the study and in particular to our partner countries and organizations, and to study director Barry Sadler, whose efforts and knowledge have resulted in the creation of this final report.

Those who have contributed to the study have also profited from the experience. It is my hope that we all can continue to share experiences. A lot has been accomplished in the relatively new field of environmental assessment, but there is still much to learn. Let us continue to work together to meet these challenges.

Michel Dorais
President
Canadian Environmental Assessment Agency

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As with so many other tasks and activities of the study, production of the final report was coordinated by Chantal Sirois of CEAA who served as coordinator of the study secretariat. My sincere thanks to her. The assistance of Charlene Roy, Sylvie Dupuis, and other members of the CEAA staff in production of the report is also gratefully acknowledged.

Finally, I owe much to Tom Shillington, who edited the report and supervised its technical production.

Barry Sadler
Study Director

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TABLE OF CONTENTS

Executive Summary

This report comprises the framework, findings, conclusions, and recommendations of the International Study of the Effectiveness of Environmental Assessment. It presents, through highlight boxes and chapter folios, key points and issues related to the practice of environmental assessment.

Environmental Assessment in a Changing World (Chapter 1)

Environmental assessment (EA) is described as one of the more successful policy innovations of the 20th Century. Thirty years ago, it did not exist. Today, it is a formal process used in more than 100 countries and organizations to help decision makers consider the environmental consequences of proposed actions. The question is whether EA can remain a relevant and effective tool into the 21st Century, responding to the demands of a changing world.

The International Study of the Effectiveness of Environmental Assessment was established to review this question. With the theme, "evaluating practice to improve performance," the study was launched in 1993 as a joint initiative of the Canadian Environmental Assessment Agency (CEAA) and the International Association for Impact Assessment (IAIA). It was taken forward under the direction of an international steering committee consisting of partner countries and organizations.

By pooling the experience of managers and practitioners, the study partners sought to take stock of the status of EA practice after 25 years, identify major strengths and limitations, and recommend measures for strengthening the practice and administration of EA to respond to the challenges of sustainable development.

The study focused on four categories of themes:

- foundations of EA, focusing on guiding values and principles;
- new dimensions in EA, focusing on the application of sustainability concepts, strategic environmental assessment, and cumulative and large-scale effects;
- process strengthening, focusing on the relationship of EA to decision making; and
- capacity building, with particular reference to needs of developing countries.

Environmental Assessment in Perspective (Chapter 2)

In recent years, the world-wide adoption of EA has significantly expanded the theatre of practice, added new roles and professional responsibilities, and brought changing perspectives to what constitutes sound performance.

Two trends stand out in the advances made to date in EA process development and application. First is the widespread establishment of EA systems by many developing countries and by countries in transition. Second, is the emergence in several industrialized nations of a second-

generation, integrated, strategic EA process more closely linked to national planning and decision-making processes.

Three critical challenges to the contemporary practice of EA can be identified:

- sharpening EA as a tool for sustainability assurance, so as to provide guidance to the larger process of decision making;
- ensuring the practical application of the integrated, second-generation EA process, particularly in the light of public sector resource constraints and the lack of consensus regarding sustainability criteria; and
- quality control into the EA process to help bridge the gap between its practice and potential.

In light of these challenges, this chapter presents principles and guidelines for the design and implementation of effective EA processes.

The Concept of Effectiveness (Chapter 3)

A concern with effectiveness is a fundamental theme of EA theory and practice. But an EA process can only be understood and evaluated in relation to the policy and institutional framework in which it operates. The real test of successful performance is the extent to which EA has "made a difference", whether better decisions follow and environmental objectives are realized.

A review of recent experience world-wide suggests four necessary ingredients to the effective application of EA:

- appropriate timing in initiating the assessment so that the proposal is reviewed early enough to scope for development of reasonable alternatives;
- clear, specific directions in the form of terms of reference or guidelines covering priority issues, timelines, and opportunities for information and input at key decision-making stages;
- quality information and products fostered by compliance with procedural guidelines and use of "good practices"; and
- receptivity of decision makers and proponents to the results of the EA, founded on good communication and accountability.

Recent experience also points to clear examples where EA has contributed both direct and indirect benefits to decision making, such as the withdrawal of environmentally unsound proposals and the generation of "green industry" opportunities.

The Views of EA Practitioners and Managers (Chapter 4)

A comprehensive understanding of the views of EA practitioners and managers with respect to the current status of EA is gained through the results of three major surveys conducted as part of the effectiveness study.

The results of a questionnaire distributed to IAIA members revealed that a majority of respondents considered:

- EA is moderately or very successful in identifying appropriate mitigation measures and in providing clear information to decision makers on the potential consequences of proposals;
- current practice is unsuccessful or only marginally successful in making verifiable predictions, in specifying the significance of residual impacts, and in providing advice to decision makers on alternatives; and
- EA is a learning process, providing important benefits beyond informing decision makers, such as the promotion of greater awareness of environmental and social concerns, upgrading of professional capabilities, and promoting public involvement in decision making.

A survey of national and international agency experience indicated that EA has a statutory basis in most jurisdictions. About two-thirds of the countries and agencies polled had either recently made major changes or were proposing reforms to their EA processes. Specific provisions for undertaking a review of the quality of EA reports are in place in about one-half of the jurisdictions surveyed.

An international survey of corporations revealed that corporate EA processes typically include a range of factors in addition to biophysical considerations, including risk, social, health, and economic factors. Recent developments include progress towards environmental management systems and greater emphasis on effective community consultation. Corporations expressed concerns about the cost effectiveness of EA, the need for improved methodologies, and changing expectations among stakeholders that may place additional demands on industry.

Four Priorities for Strengthening the Process (Chapter 5)

Project-level EA (EIA), remains a core mechanism for identifying and mitigating adverse environmental effects of development proposals. This EIA process typically addresses issues and impacts that are complex, controversial and cross-cutting -- transcending both jurisdictional and disciplinary boundaries.

Despite the many methodological and administrative advances in EIA over the past two decades, recent experience in many countries confirms that there is still considerable scope for strengthening the process. Immediate and cost-effective measures could help improve the process in four key areas: scoping, evaluation of significance, review of EA reports, and monitoring and follow-up. Good practice guidelines are identified for each of these stages of the EIA process.

A Recent Advance: Strategic Environmental Assessment (Chapter 6)

One of the most important and rapidly-evolving trends in EA practice is the recent progress with the application of EA to policies, plans, and programmes. This approach, called strategic environmental assessment, or SEA, is viewed as a promising avenue for incorporating environmental considerations into the highest levels of development decision making. However, SEA systems are still at a relatively early, formative stage. Many practical questions remain about procedures, methods, and institutional frameworks.

An effective SEA system requires political commitment and organizational support, clear guidance, appropriate methods, monitoring and compliance mechanisms, and a follow-up and feedback capability. A detailed review of current SEA approaches and practices in several countries and international organizations identifies a range of benefits from the application of SEA, including promotion of integrated decision making consistent with the principles of Agenda 21.

Good practice guidance on the application of SEA and a disciplined approach to using SEA to address cumulative effects are presented in this chapter.

The Next Step: Environmental Assessment for Sustainability Assurance (Chapter 7)

EA is acknowledged as an important tool for giving effect to sustainable development objectives in planning and decision making. In practice, the use of EA as a sustainability mechanism depends on the scope and integrity of the EA process, the larger mix of environmental and economic policy and planning instruments that are used for decision making, and the degree of policy commitment to sustainable development.

A number of countries have established both EA processes and sustainable development strategies. In these settings, there is an evident basis for strengthening EA as a tool for sustainability assurance -- that is, for ensuring that development planning is consistent with a precautionary approach to maintaining the regenerative and assimilative capacities of natural systems.

The use of EA as a sustainability assurance (rather than an impact minimization) mechanism may require adjustments to EIA and SEA, such as

- focusing on environmental "bottom lines" to stay within source and sink capacities of natural systems;

- avoiding the loss of irreplaceable and high value environmental stock by full cost analysis to determine the acceptability of impacts;
- requiring "in-kind" compensation for all other losses to ensure no net loss of natural capital.

Opportunities exist for applying these concepts within emerging policy responses to climate change, biodiversity loss and other global environmental changes. The use of EA has the advantage of providing an established "entry point" for incorporating global change considerations in the mainstream of development planning and decision making. Many practical questions remain, however. A "quick start" agenda for applying EA to global change is proposed, focusing on the United Nations conventions on climate change and biological diversity as policy references and legal commitments. Supporting actions include the development of national guidance and interpretation as to the use of EA as an implementing mechanism for the conventions, and the use of existing EA methods to the fullest extent possible.

Getting There from Here: An Agenda for EA in a Changing World (Chapter 8)

The world in which EA operates today is very different from the one in which the process was introduced. No doubt, the world in which EA will operate 25 years from now will be as different again. The challenge to EA practitioners and managers is to sharpen and position EA as a sustainability mechanism for the 21st Century.

Immediate, cost-effective opportunities exist to strengthen EA in

- establishing standards for quality performance in EA; for example, through codifying international guidelines and principles;
- upgrading EIA processes and activities, notably to improve quality control, public cinvolvement, and the consideration of cumulative effects;
- extending SEA as an integral part of decision making, through the development of practical guidance materials; and
- sharpening SEA as a sustainability instrument through the use of pilot projects.

Broad, fundamental social changes -- in globalization, deregulation, privatization, and public sector operations -- carry profound implications for EA practice in the near term. They may signal, for example, the need for international EA standards and for new modes of EA guidance and monitoring for local authorities, businesses, and consumers. They also may bring increased pressures for process efficiency and "fast-track" approaches.

Looking further ahead, the long-term reference point is sustainability of development. Decisions taken over the next generation -- decisions that can be informed by EA processes -- may well determine whether society becomes a sustainable one, or whether it overshoots resource and environmental thresholds.

CHAPTER 1:
THE INTERNATIONAL STUDY OF THE EFFECTIVENESS OF ENVIRONMENTAL ASSESSMENT

Evaluating Practice to Improve Performance

The International Study of the Effectiveness of Environmental Assessment (EA) is a joint exercise by a number of partner countries and international organizations. It was initiated and led by the Canadian Environmental Assessment Agency (CEAA) in collaboration with the International Association for Impact Assessment (IAIA). A pilot feasibility phase of the study, begun at IAIA' 93 Shanghai, concluded at the International Summit on Environmental Assessment held immediately before IAIA' 94 in Quebec City. With direction from Summit representatives, the study comprised a selected review of the recent progress and performance of EA.

Broadly stated, the purpose of the study was to take stock of the status of EA practice, identify major strengths and limitations, and brief process managers and practitioners on measures and options to meet the challenge of sustainable development. This volume comprises the final report of the effectiveness study. It summarizes the results of the review and makes recommendations for improving and upgrading EA practice. The report draws on many inputs from study partners and a wide range of collaborating agencies, organizations and individuals. Their contributions are greatly appreciated, bringing as they do important perspectives and experiences with EA practice in many countries.

This chapter provides a context for the analysis which follows, as well as an overview of the study's rationale, aims, design, and organization.

1.1 Study Rationale

Recent Progress, New Demands

In recent years, EA reached a number of milestones. Most notably, 1995 marked the quarter centenary of the pioneering US National Environmental Policy Act (NEPA, 1970) which introduced the EA process as a formal policy requirement. The subsequent world-wide adoption of EA, within a relatively short period of time, makes it one of the more successful policy innovations. Nationally and internationally, the record of use and acceptance points to the value of EA as an instrument for decision making and problem solving. Other benefits documented in this report confirm the value and contribution of EA to meeting the challenge of sustainable development.

Yet EA also falls short of realizing its full potential in that regard. Currently, it is at a crossroad of process development. New challenges and opportunities are signaled by pressing concerns about global environmental change and by recent policy measures taken by governments and international bodies to respond to them. A framework of commitments and directions to

achieve sustainable development and improve environmental management was agreed upon at the 1992 Earth Summit. The Rio Declaration of Environment and Development, Agenda 21 and the international conventions on climate change and biological diversity are its four cornerstones. Each of these documents contains further requirements or new areas of reference for EA and related instruments.

1.2 Study Objectives

Evaluating Practice to Improve Performance

A central dimension of process effectiveness is whether and to what degree EA makes a difference to decision making. Other related areas of interest, for partner countries and organizations, are the specific benefits that result from process application, the components and ingredients of success and shortfall, and the steps and measures that need to be taken to improve the performance of EA. The effectiveness study has served as both a forum and a framework for EA administrators, practitioners, and experts to exchange information and insights on these matters. Many lessons distilled from the interaction are contained in this and other reports prepared in support of the study.

The objectives of the effectiveness study report are to:

- review current issues, emerging trends, and future directions of EA;
- examine the contribution of EA to decision making;
- document what works well with existing approaches; and
- recommend cost-effective measures for improving EA, with specific reference to the challenge of sustainable development.

1.3 Frame of Reference

Themes and Aspects of Interest

A draft framework for the study was prepared based on initial consultations with interested countries, organizations, and individuals, and guided the review of effectiveness. It is updated and revised in Chapter 3 as an aide-mémoire on evaluating and auditing EA systems and processes. For present purposes, key components of the framework are the study themes and aspects of interest. These establish the scope and focus of the review by reference to particular trends, issues, and directions that are currently considered important in shaping the status of the field.

The ten themes of the effectiveness study are outlined in Folio 1.1. A more detailed version, comprising an annotated framework of questions, was circulated in IAIA's Newsletter (Vol. 6, 2, 1994) and was subsequently widely used for workshop planning and other purposes. The ten themes are subdivided into four main categories of interest with respect to effectiveness:

- *foundations of EA systems* (law, basic principles and institutional arrangements) and their adequacy;
- *scope of application*, exemplified by strategic environmental assessment (SEA), sustainability considerations and cumulative effects;
- *strengthening the EA process* in relation to key stages, activities and challenges; and
- *capacity building* with particular reference to the experience of developing countries.

Several guideposts for reviewing the status and effectiveness of EA have been followed and underpin this report:

- *Focus on practice* - This involves tapping the "hands-on" information and knowledge held by administrators, practitioners, and other experts who are directly involved in EA processes.

- *Learn from doing* - Operational experience and case examples provide the primary basis for evaluating practice, benchmarking performance, and identifying process and procedural improvements.

- *Recognize success is relative* - A critical user-perspective on effectiveness is necessary because various actors are involved in and influence the conduct of EA and the extent to which it achieves its aims.

- *Exploit the "art of the possible"* - The benefits of effectiveness research lie in problem solving rather than fault finding, i.e., in contrasting what *is* being done with what *can* be done to adapt EA practice to new challenges and realities.

- *Build on accomplishments* - As far as possible, process developments and innovations should be founded on tried and tested components.

1.4 Study Design and Execution

A Phased Approach

A four-step research design was undertaken to meet the objectives of the study. The general structure is outlined schematically in Figure 1. It was taken forward in two main phases, hinged to the International Summit on Environmental Assessment (Box 1.1).

Phase I comprised a feasibility stage to test concepts, develop frameworks, consult with interested parties, and prepare background and discussion documents for the International Summit. In this phase, a series of international workshops were held on EA effectiveness utilizing:

- various bilateral and multilateral agreements to which the Government of Canada is party; and
- a range of informal linkages with IAIA members in various centres for EA research, training, and professional development.

Phase II was taken forward under the direction of an international steering committee. The research design/strategy was adjusted to the resources made available. For its own work, the steering committee identified three "core processes", representing priority areas for improving practice and administration. These are also a central focus in this report, comprising:

- project-level environmental impact assessment (EIA);
- SEA of policies, programmes, and plans; and
- EA for sustainability assurance (ESA)

Figure 1.1
Four-Step Examination of the Effectiveness of Environmental Assessment

STEP 1
Policy Analysis of Leading Trends and Issues

STEP 2
Contribution of EA to Development Decision making
examples and comparisons

STEP 3
Operational Excellence in Application of EA
methods, procedures, and components

STEP 4
Conclusions and Guidelines for Sound Practice

Box 1.1 International Summit on Environmental Assessment

The Summit was held June 12-14, 1994 in Quebec City in conjunction with the IAIA Annual Conference. It was intended as a one-time special event to bring together EA heads of agencies and senior managers. 26 countries and 7 international organizations participated. Key objectives were: to review and discuss the preliminary findings of the EA effectiveness study; to exchange views and perspectives about key issues and challenges facing EA managers; and to identify future actions to advance EA practice.

The Summit resulted in three main initiatives:
- continuing with the EA effectiveness study and expanding its partnership base
- establishing an international network for EA managers
- support for EA capacity building and collaboration on priority activities (e.g., training).

1.5 Study Management

Work Sharing and "Virtual" Organization

A work-sharing approach has been followed in the study, with each of the partners taking lead responsibility for various components and activities. This approach has helped rationalize costs and offset resource limitations by allowing the partners to pool information and experience. In some cases, for example, it was possible to draw on staff with particular competencies to undertake an extended research task.

The study has been described as a "virtual organization". It has operated largely as an informal, electronic network of collaborating partners, spread across a wide band of time zones. A small part-time secretariat was maintained by the CEAA. Based in Ottawa, the secretariat played a key role in coordinating activities and maintaining contacts. During its tenure, the effectiveness study had no full time staff and utilized a combination of contracted, seconded and voluntary services. Each of the principal partners made both financial and in-kind contributions to support the study. In retrospect, the effectiveness study can be regarded as an experiment or pilot project in research and networking with a number of lessons for future activities of this type.

1.6 Information and Research Tools

Easy-to-Use and Do-it-Yourself Methodologies

A number of research tools have been used as part of the effectiveness study to develop the information base for this report. Most of these can be described collectively as "easy-to-use" and "do-it-yourself" methodologies. That is, they can be quickly implemented and/or are self-administered (once the framework or design stage is completed). Key methods of information gathering included:

- *International conferences and workshops:* These have been a principal support for elaborating study themes and focusing on core priorities. Major study meetings and other affiliated conferences are listed in Box 1.2.

- *Survey on the status of EA practice:* This survey was designed to canvass and benchmark "expert perspectives" on recent progress and the current status of the field. It was distributed first to IAIA members, with a second round of surveys undertaken in Europe and Australia/New Zealand, and Francophone countries.

- *Country and company status reports:* A survey of EA provisions, processes, and practice was undertaken in countries and international organizations that attended the Quebec Summit. This aspect of the study was led and coordinated by the Netherlands EIA Commission, Utrecht, and a similar exercise aimed at the use of EIA in business decision making was undertaken through the New Zealand Natural Gas Corporation.

- *Case studies and decision analyses:* These were secured directly from partner agencies, gathered for developing countries through the United Nations Environment Programme (UNEP), and solicited through several calls for papers to IAIA members. A common format for case study preparation was used in hard copy and on an electronic template distributed by the Australian Environment Protection Agency (EPA).

- *Reports and studies on integrated approaches to impact analysis:* These were prepared by various partners to address cross-cutting issues and factors commonly encountered in the application of EA. Areas covered are described in Box 1.3 and include health, economics, traditional knowledge, global change, environmental sustainability, and a tool kit of available methods.

Box 1.2: Conferences and Workshops Contributing to the Final Report

- IAIA Annual Conferences (Shanghai, China, 1993; Quebec City, Canada, 1994)
- Hong Kong-Canada EIA Workshop (Hong Kong, 1994)
- 7th Tripartite Australia-Canada-New Zealand Workshop (Canberra, Australia, 1994)
- Nordic EIA Effectiveness Workshop (Helsinki, Finland, 1994)
- CEMP Think-tank on EA Effectiveness (Banchory, Scotland, 1994)
- International Summit on Environmental Assessment (Quebec City, Canada, 1994)
- Netherlands Workshops on SEA Effectiveness and Policy-Level Applications (The Hague, Netherlands, 1994)
- UNEP Expert Group Meeting on EIA Good Practice (Nairobi, Kenya, 1995; Geneva, Switzerland, 1996)
- Australian Workshop on EIA Process Strengthening (Canberra, Australia, 1995)
- Meeting of EIA Experts from Francophone Countries (Paris, France, 1995)
- Workshop on EIA Quality (Manchester, UK, 1996)
- Final Meeting and Workshop of Study Partners (Amsterdam, Netherlands, 1996)

Box 1.3: Background Studies and Companion Reports

- Health and Environmental Assessment -- (Health and Welfare Canada, Canada)
- Global Change and Environmental Assessment -- (Canadian Global Change Programme, Canada)
- Economic and Environmental Assessment -- Towards an Integrated Approach -- (Foundation for International Training, Canada)
- Indigenous Peoples and Environmental Assessment -- (University of British Columbia and Centre for Traditional Ecological Knowledge, Canada)
- Tool Kit for Environmental Assessment -- (Environment and Ground Water Institute, University of Oklahoma, USA)
- Cumulative Effects Assessment -- (US Council of Environmental Quality)

1.7 Product Use and Development

Looking to Lisbon and Beyond

The main information products of the effectiveness study are its reports and documents. These comprise source materials for use by study partners. It is expected that the results and findings of the study will be reviewed by agencies and international organizations to consider whether and how they might be applied to EA practice and process development. Others may also find materials and aspects useful for training, research, guidance in practice and related purposes. However, the real value of the study has resided in the process and in the immediate "take away" ideas that participants have already applied or adapted to their home practice (see Box 1.4).

The effectiveness study has been cross-referenced with two UNEP initiatives: the *Guide to EIA Practice;* and the *EIA Training Resource Manual* (developed by the Australian EPA). Both are expected to have wide circulation, especially in developing countries. Key findings and materials of the effectiveness study have been included in these documents. This arrangement largely covers the capacity building theme of the study as described in Folio 1.1. Case studies and other documents of the effectiveness study will be maintained in an on-line data base by the Australian EPA for use by IAIA members and others, and will be applied in support of training initiatives to test and apply the UNEP Training Manual.

Usually, EA studies have a relatively short shelf life, soon becoming dated in what is, after all, a fast-developing field. This and other study reports are best seen as a stepping stone or catalyst to effectiveness review, the real objective of which is to continuously upgrade and improve process, practice, and performance. The theme of the IAIA '96 conference being *Improving Environmental Effectiveness - Research, Practice and Training*, the report(s) of the effectiveness study, together with submitted papers and other inputs, will be used to develop a wider suite of ideas and recommendations regarding future directions for EA and other areas of impact assessment.

Box 1.4: Examples of "Take Away" Products from Participation in the Effectiveness Study

- Netherlands Ministry of the Environment drew on experiences of other countries and inputs from SEA workshops in finalizing requirements for "environmental action" for policy proposals.
- Norway's Ministry of the Environment also used the same information in developing its administrative order on environmental assessment of policy proposals.
- Hong Kong Environmental Protection Department and Israeli Ministry of the Environment used information and ideas from other countries in drafting their EIA bills.

1.8 Structure and Content of Final Report

Taking Stock of EA Assets and Limitations

This report, in taking stock of the status of EA, has drawn primarily on the effectiveness study materials described above. As well, there is a major body of work comprising previous and parallel studies that deal either directly or indirectly with EA effectiveness. Without being comprehensive, the findings of many secondary sources are also incorporated or referenced in the pages that follow. These may be helpful to readers in pursuing their lines of interest in the literature.

In preparing this report, the concern has been to take a comparative perspective, drawing on lessons and experiences from different countries that appear to have wide or general application. The report, however, is intended as an overview, and readers are referred to companion studies for more detailed discussion of specific issues. Greater relative weight is placed on new and emerging areas of practice, compared to more long standing and well-worked areas. (For example, the methodological and procedural basis of EA is extensively reviewed in the general literature and will be taken as read, rather than repeated).

In outline, this report is organized as follows:

- *Chapter 2* reviews international trends, issues and directions in EA process development;
- *Chapter 3* provides perspectives on effectiveness of EA for decision making;
- *Chapter 4* surveys the status of EA based on views of practitioners and administrators;
- *Chapter 5* sets out priority areas for improving on the quality of practice of project EIA;
- *Chapter 6* examines recent advances in SEA of policies, plans, and programmes;
- *Chapter 7* discusses options for full cost assessment for sustainability assurance; and
- *Chapter 8* presents the conclusions and recommendations of the study, and looks ahead to the future of EA in a changing world.

Throughout each chapter, highlight boxes and folios provide examples and other detailed information to illustrate key points noted in the text.

Folio 1.1 The Ten Themes of the EA Effectiveness Study

A. Foundations - Adequacy of EA Systems

1. Guiding Values and Principles

- purpose and orientation of EA
- basic requirements for an effective process
- key values, objectives, and principles of approach
- procedural and methodological implications

B. New Dimensions - Scope of EA Process

2. Application of Sustainability Concepts

- nature and implications of sustainability concepts
- translation into operational guidelines and rules of thumb
- incorporation into EA policy and practice
- adjustments to procedures and methods

3. Strategic Environmental Assessment (SEA)

- rationale and potential of SEA
- linkages to project EA and other policy and planning instruments
- recent approaches and arrangements for the conduct of SEA
- institutional and methodological constraints and opportunities

4. Cumulative and Large-Scale Effects

- definitions and requirements for addressing cumulative effects
- project-oriented ecosystem approaches
- frameworks for planning and monitoring
- relationships to product assessment life cycle analysis and environmental audit

C. EIA Process Strengthening - Elements of Approach

5. Relationship to Decision Making

- utility of inputs to decision-making process
- importance of evaluation of alternatives
- EA documentation and quality review
- implementation of terms and conditions

6. Integrated Approaches to Impact Analysis

- "best guess" science paradigms and practices
- traditional knowledge
- user-friendly tools, techniques, and information technologies
- relationship of socio-economic, bio-physical, health, and risk components

Folio 1.1 The Ten Themes of the EA Effectiveness Study (cont'd)

7. Public Participation and Dispute Settlement

- conflict resolution in the EA process
- provisions for public scrutiny and involvement
- forms of participation and negotiation
- relationship to decision-making powers and responsibility

8. Follow-up and Post-Project Analysis

- requirements for follow-up to EAs
- experience with effects monitoring and impact management
- use and results of EA audits
- ex-post reviews for process development

9. Total Process Management

- managing for quality, integrity, and innovation
- coordination of EA processes with other policy, planning, and regulatory instruments
- coherence of EA systems, including protocols and procedures for transboundary EA
- information and communication media

D. Capacity Building

10. Capacity Building, with Particular Reference to Developing Countries

- needs and demands
- training, networking, and cooperation
- research, development, and pilot projects
- EA skills and competencies for the 21st Century international standards

CHAPTER 2:
ENVIRONMENTAL ASSESSMENT IN PERSPECTIVE

This chapter briefly describes the evolving international background against which the effectiveness of EA systems and activities will be reviewed and discussed

> *"The environment is where we live; and development is what we all do. The two are inseparable."*
>
> *Gro Brundtland, Our Common Future; 1987. xi.*

Assessment links environment and development. When placed in the context of the Brundtland report, the importance of EA as a basis for planning for a common future cannot be overstated (see Box 2.1). This approach is centered on, but is not restricted, to environmental impact assessment (EIA). It is institutionalized primarily to predict and mitigate the biophysical, social, and other related effects and consequences of proposed development schemes and actions. More broadly, EA is used for early-warning planning of a wide range of resource use, development, and conservation initiatives in order to make the most of options for achieving sustainability (Jacobs and Sadler, 1989; Gibson, 1993). In both cases, EA is an enabling tool for informed decision making that is applied flexibly to the task at hand.

In recent years, the world-wide adoption and adaptation of EA has significantly expanded the theatre of practice, added new roles and professional responsibilities, and brought changing perspectives on what constitutes sound performance. These developments are the subject of an increasing literature to which there are hundreds of new entries each year in the English language alone, plus a comparable or greater volume of impact statements, EA reports, and other documents that result from assessment practice. (For a recent update, see EIA Centre, 1995a.) The concern here is with the common denominators of EA process, and with the broad contours of recent change in international practice.

The following survey responds to Theme One of the effectiveness study and provides "points of reference" for subsequent review and analysis. Four aspects are discussed:

- the aims, principles and elements of approach that underpin EA systems world-wide;
- recent trends and directions in EA process development;
- key challenges of contemporary practice; and
- important examples of EA laws, policies and institutional arrangements.

Box 2.1 Why EA is Important

- *The environment matters more than ever before.* Human activities are altering natural cycles and systems on an unprecedented scale. For the first time, the cumulative effects of development activities are estimated to be on par with biophysical processes as an agent of ecological change.
- *Risks and impacts are more significant than ever before.* We live in a greenhouse world of ozone holes and vanishing species. Many reputable scientists consider that the impact of human activities on the biosphere is reaching critical thresholds, with the consequent threat of ecological breakdown and social conflict.
- *EA is more important than ever before.* This approach provides a basis for designing policies and plans that take account of environmental potentials and constraints, and for managing the impacts and risks of development projects and activities.

2.1 Foundations of Assessment

2.1.1 Definitions

World-wide, EA is applied to a wide range of policy, developmental, and geographical settings. EA is institutionalized as a formal separate process under various legal and institutional arrangements established by countries, provincial jurisdictions, and international organizations. As well, it is taken forward informally through other development planning and resource management systems. Yet, there are also features and principles that are common to all assessment activities. These are briefly listed here, beginning with definitions that distinguish generally between EA, EIA and other forms of impact assessment.

EA and other key related terms and are defined in Box 2.2. As used in this report, EA is a generic process that includes EIA of specific projects, SEA of policies, plans, and programmes, and their relationship to a larger set of impact assessment and planning-related tools. Figure 2.1 illustrates these components and their respective application as part of the larger scheme of assessment activities and approaches to link together environment and development *pace Brundtland*. Within the scope of the definitions in Box 2.2, all of these tools have their place in EA as an integral part of overall planning and decision making. Specifically, they help to augment formal EIA and SEA processes, respectively applying their basic principles throughout the project life cycle and across different forward planning contexts.

It is also important to note that the terms and relationships as defined here may have different meanings and interpretations in different countries. EA and EIA, in particular, are often used interchangeably. Most countries, for example, have established EIA systems; some, however, describe a near equivalent or comparable process as EA. With few exceptions, the goals, principles and outputs are the same or similar (although in the US federal system, the term EA refers to an initial assessment). Accordingly, when reference is made to the processes

established by countries or international organizations, these are described by their formal title and specific designations are used (e.g., World Bank EA procedures, EIS preparation in the US). Otherwise, the distinctions introduced above are maintained: EA is the general form; EIA is the project-specific form.

Both processes are understood to include risk, social, economic, cultural, health, and other relevant factors. These aspects are typically considered in EAs of development proposals. However, social impact assessment (SIA), risk assessment, and technology assessment are also the focus of separate processes and comprise areas of specialization by practitioners. Given the continued diversification of impact assessment, more recent sub-components are included either peripherally or not all in this review (see Vanclay and Bronstein, 1995).[1]

Box 2.2 Definitions

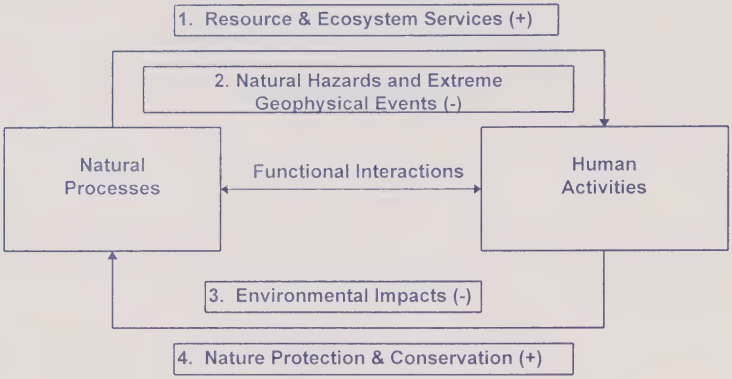
- *Environmental assessment* (EA) is a systematic process of evaluating and documenting information on the potentials, capacities, and functions of natural systems and resources in order to facilitate sustainable development planning and decision making in general, and to anticipate and manage the adverse effects and consequences of proposed undertakings in particular.
- *Environmental impact assessment* (EIA) is a process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of proposed projects and physical activities prior to major decisions and commitments being made.
- *Strategic environmental assessment* (SEA) is a process of prior examination and appraisal of policies, plans, and programmes and other higher level or pre-project initiatives.
- *Social impact assessment* (SIA) is a process of estimating the social consequences that are likely to follow from specific policy and government proposals, particularly in the context of national EA requirements (Inter-organizational Committee on Guidelines and Principles, 1994, 108).

2.1.2 Purpose and Aims of EA

The substantive purposes of EA are twofold. First, the *immediate aim* is to facilitate sound, integrated decision making in which environmental considerations are explicitly included. The EA process does so by providing clear, well organized information on the environmental effects, risks, and consequences of development options and proposals. Secondly, the EA process is usually (but not universally) directed toward achieving or supporting *ultimate goals* of environmental protection and sustainable development. These reference or end goals are variously phrased and framed in EA laws and policies, as are the specific objectives to be met by the process. Examples of different context and wording are given in Box 2.3.

[1] Vanclay and Bronstein's (1995) review of the field include a dozen forms of impact assessment. These are: environmental impact assessment, social impact assessment, technology assessment, policy assessment, economic and fiscal assessment, demographic impact assessment, health impact assessment, climate impact assessment, development impact assessment, environmental auditing and environmental sustainability. Other foci of specialization also discussed in the volume or referenced in the IAIA Directory include: gender impact assessment, psychological impact assessment and noise impact assessment. The conceptual and practical relationship among the forms of impact assessment appears to require further clarification. This is possibly a task for IAIA.

Figure 2.1: Assessment, Environment, and Development



The functional interrelation between natural and human systems are simplified into four categories with positive and negative emphasis in relation to sustainable development. The respective components of assessment include:

1. resource capability and ecosystem "mapping"
2. natural hazard and landscape sensitivity evaluation
3. EIA and other forms of impact assessment
4. ecosystem approaches, e.g., critical zone, habitat supply, significant area and gap analyses.

Source: modified from de Groot, 1995.

Internationally, EA is becoming a *multi-purpose* process, with increasing emphasis given to promoting long term, societal goals that reflect and express the ideals of sustainable development. These include:

- safeguarding valued ecological processes and heritage areas;
- avoiding irreversible and unacceptable loss and deterioration of natural capital;
- ensuring development is adjusted to the potentials and capacities of the resource base;
- optimizing natural resource use, conservation and management opportunities;
- protecting human health and community well being; and
- addressing distributional concerns related to the disruption of people and traditional lifestyles.

As a widely used (though not the only) process for meeting these objectives, EA also meets a number of supporting and secondary aims. These are considered to include the following:

- improving coordination among participating agencies and actions;
- fostering better designed and planned development projects, i.e., greener and more cost-effective;
- empowering community development and building local capacity through public participation;
- instilling environmental values and accountabilities across a range of institutions; and
- internalizing environmental costs and damages in industry consistent with the polluter pays principle.

Box 2.3 Examples of Statements of EA Purpose

World Bank Operational Directive (4.01, 1991). "The purpose of EA is to improve decision making and to ensure that the project options under consideration are environmentally sound and sustainable."

New Zealand Resource Management Act, 1991. The purpose of the Act is: "to promote the sustainable management of natural and physical resources". The provision for the application of assessment is provided by a key sub-clause that defines sustainable management as: "avoiding, remedying or mitigating any adverse effects in the environment" (section 5c). The Act requires an effects-based approach without specific reference to EA procedure.

Canadian Environmental Assessment Act, 1995. The purpose of the Act is to:

- ensure that the environmental effects receive careful consideration before responsible authorities take actions in connection with them
- encourage responsible authorities to take actions that promote sustainable development and thereby achieve or maintain a healthy environment and healthy economy
- ensure that projects that are to be carried out in Canada or on federal lands do not cause significant adverse environmental effects outside the jurisdictions in which the projects are carried out
- ensure that there be an opportunity for public participation in the environmental assessment process.

2.1.3 Role and Application to Decision Making

A review of EA systems around the world indicates a number of ways in which the process is applied to decision making. In the large majority of cases, EIA and SEA take place under formal institutional arrangements and form the basis for authorization of a proposal and the establishment of terms and conditions for its implementation. These arrangements typically comprise a national or equivalent framework of the laws, regulations, procedures, and guidelines which set out the rules, steps, and activities by which assessments are undertaken. The aim is to follow a systematic procedure to ensure that specified proposals identified as having potentially significant effects are subject to EA. The process is applied in accordance with requirements and the information is submitted to decision making in advance of a final choice of a proposal. Depending on jurisdictional arguments, the EA process may be advisory or regulatory -- tied to the issues of licensing and permits or other types of condition-setting.

Usually, only controversial proposals are subject to direct political decision making, although the degree of intervention obviously varies among countries. With few exceptions, the result of an EA is one of a number of factors taken into account in political (and administrative) decision making. Typically, these decisions, will involve a series of trade-offs among economic, environmental, social and other criteria. Striking a balance among these factors lies at the heart of integrated decision making for sustainable development. This political art is a central and crucial link in the connection between EA and environmental protection. Because the trade-off process takes place largely behind "closed doors", there is, at best, only a generalized understanding of how decisions are actually reached in such cases.

However, there are a number of institutional checks and balances built into the EA process that work toward ensuring the information provided is consequential. Most significantly, a number of countries provide for public involvement and for independent (agency or public) EA review of major proposals. This role varies. In some cases, the review process is restricted to providing objective, technical commentary on the adequacy of assessment (e.g., Netherlands); in other cases, the process results in recommendations on project justification, alternatives, and terms and conditions (e.g., Canada, Australia), including provisions for monitoring and other forms of follow-up. Certain EA processes have significant decision-making powers with regard to major projects. An example is the Ontario Environmental Assessment Board; its rulings on projects and plans that have undergone public hearings can be overturned only by Cabinet Order within a twenty eight day period.

Although these types of processes gain the most attention, the great majority of assessments are relatively straightforward and lead to routine decisions on proposals by the competent authority. Under most government systems, these decisions are "delegated" to the administrative levels by a responsible minister or an equivalent political authority. In this regard, Doyle's (1994) rule of thumb regarding proposals processed by Ontario's EA system is instructive:

- 3000 proposals a year are received of which 90% are exempt from EA;
- 300 proposals undergo preliminary assessment with little or no problem;
- 30 proposals are subject to full EA;
- 3 proposals go to public hearings and consume much of the time and effort of the EA Branch and gain high public and political attention.

2.1.4 Elements of Approach

Internationally, the EA process either closely follows or broadly approximates the well known, main pattern of steps and activities which lead from initiation and screening to decision making and implementation. Figure 2.2 generalizes this process. The steps represented here and described in Box 2.4 were agreed upon by the UNEP teams preparing the *Guide on EIA Good Practice* and the *EIA Training Manual* to facilitate cross-usage of the documents, recognizing that actual components and phases vary with the jurisdictional framework and that others may conceptualize the process differently. Overall, the important point to stress is the structured, logical approach that is followed to fact finding, gaining public input analysis, and testing of information and organization of findings in a report format to assist decision making. This

process has both stood practice in good stead and become strengthened as a result of accumulated experience.

Drawing on case experience, it must be emphasized that the EA process is meant to be applied *purposively* (fitted to function), *flexibly* (not all steps may be needed), and *relatively* (so there is a focusing on key issues). Within federal states, and also increasingly in a tranboundary context, the harmonization of EA systems is of importance, with a view to avoiding duplication and ensuring the decisions taken in one jurisdiction take account of their potential effects on adjacent countries. The overall approach is one of adaptiveness to the problems under review, to their context and circumstances and to the requirements of decision making. A continuing process of "internal" decision making takes place regarding the level and scope of assessment, the factors that will be reviewed, and the opportunities for public input.

For present purposes, the process is divided into three major stages:

- *Preliminary assessment*: This involves, in general terms, classifying proposals in accordance with the level and type of assessment warranted. Different countries use different types of screening and scoping procedures for this purpose, as described in Chapter 4. However, more important than the procedure itself is a "political culture of application" that encourages (see Box 2.5):

    - consistency in referrals of environmentally significant proposals for detailed assessment, supported by relevant information on key issues and study requirements; and

    - consideration of proposals that are less environmentally significant but which require some degree of further examination, e.g., because of potential cumulative effects. (In many systems, this appears to be an area in which performance could be tightened considerably by the use of preliminary and class assessments or other equivalent cost-effective procedures.)

- *Detailed assessment:* Key aspects of this stage of the process are the application of a multi-disciplinary scientific approach to gather and analyze information and views and the preparation of an environmental impact statement or report as an input to decision making. The procedural and methodological "infrastructure" of the EA process are important determinants of the quality of the documentation produced, which in turn is an important aspect of EA effectiveness. In broad perspective, four particular ingredients of process effectiveness stand out:

    - appropriate procedural requirements and guidance as to their application;
    - provision for and thoroughness of examination of alternatives;
    - soundness of technical analysis as evidenced by the use of "best practical science"; and
    - opportunity for public involvement and input at key points in the process. This is a cornerstone of international good practice, though it is not universally adopted because of political and cultural differences.

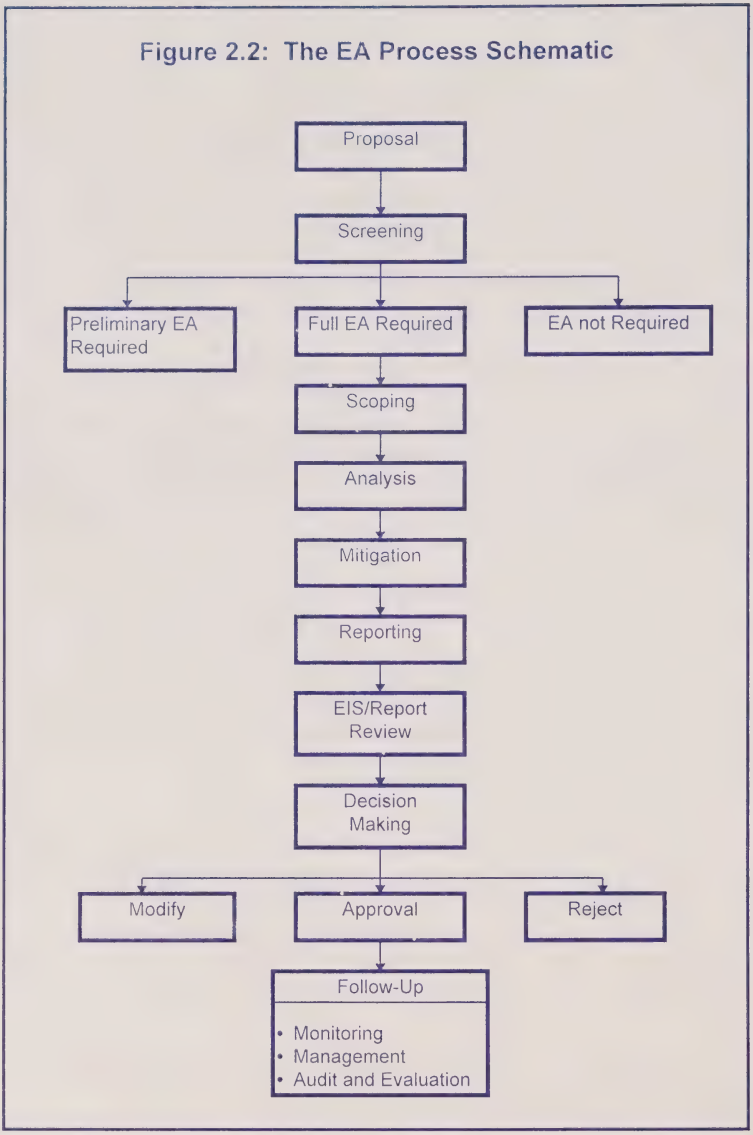


Figure 2.2: The EA Process Schematic
Proposal
Screening
Preliminary EA Required
Full EA Required
EA not Required
Scoping
Analysis
Mitigation
Reporting
EIS/Report Review
Decision Making
Modify
Approval
Reject
Follow-Up
• Monitoring
• Management
• Audit and Evaluation

Box 2.4 Main Stages of EIA Process -- Generic Steps and Activities

Preliminary Assessment:
- *screening* to establish whether EIA is required and the likely extent of process application
- *scoping* to identify the key issues and impacts that need to be addressed and prepare terms of reference for EIA

Detailed Assessment:
- *impact analysis* to identify, predict, and evaluate the potential significance of risks, effects, and consequences
- *mitigation* to specify measures to prevent, minimize, and offset or otherwise compensate for environmental loss and damage
- *reporting* to document the results of EIA, including recommended terms and conditions
- *EIS review* to ensure the report meets terms of reference and standards of good practice
- *decision making* to approve (or not) a proposal and establish terms and conditions

Follow-up:
- *monitoring* to check actions are in compliance with terms and conditions, and impacts are within the ranges predicted
- *management* to address unforeseen events or unanticipated impacts
- *audit/evaluation* to document results, learn from experience, and improve EIA and project planning

Box 2.5 A Supportive Culture of EA Application

This is founded on several interrelated conditions:
- mandate provided by law/administrative regulation
- basic procedural and methodological infrastructure
- political commitment as demonstrated by the use of EA results
- common understanding of process aims, requirements, and benefits
- provision of sufficient funding to get the job done
- adequate institutional and technical capacity
- up-to-date information and data in a form suitable for processing many screening decisions

- *Follow-up to decision making:* Many approvals made on the basis of comprehensive EA involve modifications to the original proposal and/or the imposition of terms and conditions for implementation. Generally the provisions for follow-up are tied to the potential environmental significance of the proposal and/or reflect uncertainty about predicted impacts. In an increasing number of jurisdictions, environmental (or impact) management plans provide a framework for implementation of measures specified in EA appraisals, with revisions made on the basis of compliance and effects monitoring. With few exceptions, however, this part of the EA process has structural weaknesses by comparison to the pre-decision stages. This is beginning to change but much more still needs to be done to place follow-up on a relatively sound footing (see Chapter 5).

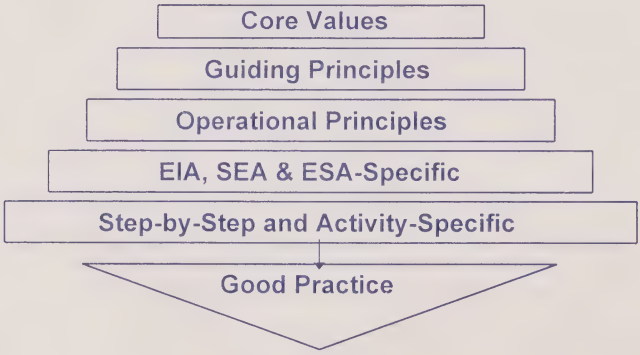
2.1.5 Core Values and Principles

The basic principles which underlie and guide national and international EA processes in achieving their objectives are identified in laws, procedures, and guidelines. Most of these principles are long standing, widely held across jurisdictions, and thus constitute an international consensus in the fundamentals of approach. As experience has increased, basic principles of EA have been augmented and supplemented by lessons of practice. Now emerging is a hierarchy of principles in which the generally-agreed approach to EA is extended by a second tier of operational principles broadly concerned with EA good practice.

A sub-objective of the effectiveness study is to examine the values and principles that guide EA practice. Figure 2.3 provides the framework for this purpose. It differentiates the levels and types of principles reviewed in this report. This structure is not necessarily representative of the considerable documentation on EA guidelines now available, which differs considerably in scope, detail, and usefulness for practitioners. From an effectiveness perspective, the main concerns are with widely accepted principles for:

- the design and development of an effective EA process; and
- undertaking EIA and SEA activities consistent with international standards of "good practice".

Figure 2.3: Hierarchy of Principles and the Relation to Good Practice



In this report, a linked set of general and operational principles are outlined, beginning here with fundamentals of approach. Other chapters will develop key aspects. The hierarchy of principles in Figure 2.3 can be keyed first to three core values or touchstones which impart purpose and direction to EA actions and approaches. These values correspond to instrumental, visible and ultimate ends for the EA process, and comprise:

- *integrity* -- the process will conform with accepted standards and principles of good practice;
- *utility* -- the process will provide balanced, credible information for decision making; and
- *sustainability* -- the process will promote environmentally-sound development, i.e., within the assimilative and regenerative capacity of natural systems (see Chapter 7).

Next, there are guiding principles for an effective EA process. These elaborate the core values above, identify fundamental legal and policy requirements, and serve as benchmarks for administering and monitoring the performance of EA systems. Fourteen principles for process design and development, considered important by many EA administrators and practitioners, are outlined in Box 2.6. In brief, key factors are:

- *a well founded legislative base* with clear purpose, specific requirements and prescribed responsibilities;
- *appropriate procedural controls* to ensure the level of assessment, scope of consideration and timetables for completion are relevant to the circumstances;
- *incentive for public involvement* with structured opportunities tailored to the issues and interests at stake;
- *problem- and decision-orientation*, concerned with the issues that matter, the provision of consequential information, and explicit linkage to approvals and condition-setting; and
- *follow-up and feedback capability* including compliance and effects monitoring, impact management, and audit and evaluation.

All of the principles identified above and in Box 2.6 are based on the accumulated lessons of two decades of experience with EA. In certain cases, notably related to follow-up mechanisms, the principles incorporate a recognition of current inadequacies rather than exemplary developments. Overall, however, the principles build upon positive developments and trends. The list, of course, is selective and the categories included could be described and combined in other ways with equal validity. Also, as Gibson (1993) notes, such principles are interdependent, and should be considered and applied as a single package, recognizing their capacities, expectations and issues vary internationally.

Finally, basic principles for effective EIA practice are outlined in Box 2.7. These were developed from practitioners inputs over a series of study workshops. In some cases, these draw from and elaborate process design and development principles. However, the 21 principles for effective EIA practice are directed primarily toward process implementation, and have specific reference to project design planning and approval. Key considerations in this regard are to:

- apply EIA consistent with the criterion of "fitness for purpose";
- undertake the process in accordance with procedural (or best practice) guidance;
- address the issues that really matter; and
- provide sound, consequential information for decision making -- which is the best guarantee of acceptance of EA inputs.

Box 2.6 Principles for Design and Development of Effective EA Processes

1) ***clear mandate and provisions***: vested in law, have specific, enforceable requirements, and prescribe the responsibilities and obligations of proponents and other parties

2) ***explicit goals and objectives***: a clear purpose and dedication to achieving environmental protection and/or sustainable development

3) ***uniform, consistent application:*** automatically applied to all proposals and actions with potential environmental effects and consequences

4) ***appropriate level of assessment***: scaled to the degree of environmental significance and extent of public concerns associated with a proposal

5) ***relevant scope of consideration***: examine all pertinent environmental options to and aspects of a proposal, including cumulative effects, interrelated socio-economic, cultural and health factors, and sustainability implications

6) ***flexible, problem-solving approach***: adapted to deal with a range of proposals, issues, and decision-making situations

7) ***open, facilitative procedures***: transparent and readily accessible, with a traceable record of assessment decisions and timely opportunities for public involvement and input at key stages

8) ***necessary support and guidance***: requisite level of resources and procedural guidance for conducting assessments in accordance with requirements, principles and standards of good practice

9) ***"best-practice" standards***: undertaken with professionalism, objectivity and credibility, as identified by "best-practices" in impact science, public consultation and process administration

10) ***efficient, predictable implementation***: applied in a timely manner that fosters certainty, minimizes delay and avoids unnecessary burdens on proponents

11) ***decision-oriented***: provide sound, tested practical information that is readily usable in planning and decision making

12) ***related to condition-setting***: explicitly linked to approvals and, as necessary, to specified terms and conditions

13) ***follow-up and feedback in-built mechanisms***: explicit measures for checking on compliance with conditions, monitoring effects, managing impacts, and auditing and evaluative performance

14) ***cost-effective outcomes***: promote actions that ensure environmental protection at least cost to society

Sources: Basic reference documents were supplied by Australia and comprised national principles for EIA incorporated into the Intergovernmental Agreement on the Environment (1992) and guiding principles for the Commonwealth EIA process prepared by the Environment Protection Agency (1995). These materials were discussed from an international perspective at the 7th Australia-Canada-New Zealand Tripartite Workshop, at other effectiveness study meetings and by the Canadian EA Administrators at their 1994 and 1995 Annual Meetings (Doyle and Sadler, 1996). Critical review of the field by Gibson (1993a) and Wood (1995), were also used in finalizing the principles.

Box 2.7 Principles For Effective EIA Practice

EIA should be applied:

- to all development projects or activities likely to cause potentially significant adverse impacts or add to actual potential foreseeable cumulative effects
- as a primary instrument for environmental management to ensure that impacts of development are minimized, avoided or rehabilitated
- so that the scope of review is consistent with the nature of the project or activity and commensurate with the likely issues and impacts
- on the basis of well defined roles, rules and responsibilities for key actors

EIA should be undertaken:

- throughout the project cycle, beginning as early as feasible in the concept design phase
- with clear reference to the requirements for project authorization and follow-up, including impact management
- consistent with the application of "best practicable" science and mitigation technology
- in accordance with established procedures and project-specific terms of reference, including timelines
- to provide appropriate opportunities for public involvement of communities, groups, and parties directly affected by or with an interest in the project and/or its environmental impacts

EIA should address, wherever necessary or appropriate:

- other related and relevant factors, including social and health risks and impacts
- cumulative and long-term, large scale effects
- design, locational, and technological alternatives to the proposal being assessed
- sustainability considerations including resources productivity, assimilative capacity, and biological diversity

EIA should result in:

- accurate and appropriate information as to the nature, likely magnitude, and significance of potential effects, risks, and consequences of a proposed undertaking and alternatives
- the preparation of an impact statement or report that presents this information in a clear, understandable, and relevant form for decision making
- the EIS identifying the confidence limits that can be placed on the predictions and clarifying areas of agreement and disagreement among the parties involved in the process

EIA should provide the basis for:

- environmentally sound decision making in which terms and conditions are clearly specified and enforced
- the design, planning, and construction of acceptable development projects that meet environmental standards and management objectives
- an appropriate follow-up process with requirements for monitoring, management, audit and evaluation
- follow-up requirements that are based on the significance of potential effects, and on the uncertainties associated with prediction and mitigation
- learning from experience with a view to making future improvements to design of projects or the application of the EA process.

2.2 The Evolution of EA

Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.
Principle 17, The Rio Declaration on Environment and Development.

The history of EA has been one of remarkable progress. In retrospect, three trends stand out:

- the adoption of EA world-wide from its US origins;
- the innovations in law, method and procedure that have driven the development of the process; and
- the expansion in the scope of assessment in response to new challenges and issues.

On these counts, EA can be said to be a highly successful policy instrument, possibly, in Bartlett's (1988) view, one of the major policy innovations of the 20th Century. A striking feature of this record is the *internationalization* as well as the institutionalization of EA activity. The symbols of progress in this regard are the US *National Environmental Policy Act* (NEPA, 1970) and the Rio Declaration on Environment and Development, 1992. It is clear that the architects of NEPA intended to redirect US federal policy making and administration. What they likely did not foresee was the extent to which EA would become adopted by so many other countries culminating two decades later in Principle 17 of the Rio Declaration. Key milestones marking the road from NEPA to Rio and beyond are described in this section.

2.2.1 Back to the Beginning

The foundations of the EA process were established 25 years ago by the enactment of the US *National Environmental Policy Act* (NEPA). Since then, institutional frameworks have taken different forms, and the process has diversified considerably. However, the spirit and purpose of EA in NEPA has stood the test of time. The Act has significantly influenced process development and can be fairly described, paraphrasing the US Council on Environmental Quality (1993), as the "Magna Carta" of the field. In its declaratory language, for example, the Act, anticipates the sustainability definitions of the "Brundtland" report by fifteen or so years.

The purposes of the Act, *inter alia*, are "to promote efforts which will prevent or eliminate damage to the environment and biosphere" (Sec. 2). To those ends, federal agencies "shall utilize a systematic, interdisciplinary approach", which "will ensure that presently unquantified environmental values may be given appropriate consideration in decision making along with economic and technical considerations" (Sec. 102). Most, if not all, definitions of EA, statements of aim and elaborations of principle follow from this nuclear idea. Specifically, the preparation of an environmental impact statement (EIS) was intended to be an explicit, "action forcing" mechanism to implement the law, to change agency behavior, and to carry the use of interdisciplinary science into the heart of public policy making (Caldwell, 1982).

2.2.2 World-wide Adoption of Assessment

Twenty years ago, only a handful of countries had introduced EA. Today, it is estimated that more than 100 countries have national EA systems in place. At the international level, lending banks and bilateral aid agencies have EA procedures that apply to borrowing and recipient countries. In addition, within some federal countries, state or provincial jurisdictions have instituted separate EA processes that are independent from the national level. For example, more than 30 US states either have established limited forms of EA review or have enacted so called "little NEPAs" (the California process alone is larger or equivalent to those in most other industrial countries in terms of documentation and activity). In Canada, all ten provinces and both territories have their own EA systems, and there are different processes established for each native land claims settlement area north of 60^0N, certain types of joint regimes for areas of overlapping jurisdiction, and a range of municipal systems. When autonomous provincial jurisdictions are added, the number of major EA regimes probably rounds out to 200.

Key stages in the world wide adoption of EA include the following:

- In 1973 and 1974, Canada, Australia, and New Zealand were the first countries to follow the NEPA example. Unlike Australia, which legislated EIA, Canada and New Zealand initially established administratively-based procedures.

- During the 1970s, other industrial and developing countries introduced formal EIA requirements (e.g., France, 1976; Philippines, 1977) began to use the process informally or experimentally (e.g., Netherlands, 1978) or adopted elements, such as impact statements or reports, as part of development applications for planning permission (e.g., German states [lander], Ireland).

- Within the European Union, the 1985 Directive on EIA established minimum provisions for compliance by the member states. On coming into force in 1988, the Directive spurred national legislation and process development, although progress reportedly still remains uneven among member states.

- In 1989, under Operational Directive (amended 1991), EAs became a standard requirement for all World Bank financed investment projects. The primary responsibility for compliance with the Bank's EA procedures lies with the borrowing countries. As a result of these and similar requirements by other development banks and donors, EA came into wide use in developing countries.

- The 1992 Earth Summit resulted in a supra-structure of international law and policy that, inter alia, promotes the use of EA, e.g., by signatory countries to the conventions on biological diversity and climate change. Post-Rio, various capacity building activities now underway by multilateral and donor agencies represent a further phase of the world-wide spread of EA. Recently, many developing countries have introduced EA legislation, as described below.

2.2.3 Twenty Five Years of Process Development and Innovation

The evolution of the EA process as reflected by collective experience is summarized in Box 2.8. It is organized into several overlapping phases (see also Burdge, 1991). All dates are approximate and their correspondence to national EA histories will be coincidental, except for previously noted countries that were the first to adopt the process. For present purposes, the key points to note are:

- the reasons for the introduction of EA -- which are still relevant today;
- the record of procedural and methodological innovation;
- the expanded scope of assessment;
- the development of more integrated approaches; and
- their application in the context of sustainable development framework.

- *Introduction of Assessment*: Several converging factors led to the introduction of EA in 1970. These included: a tradition of rational planning; a new level of public concern about the environment; the increasing scale and wider repercussions of major development schemes; and the failure of project appraisal and review procedures to account for evident ecological and community impacts (O'Riordan and Sewell, 1981; Caldwell, 1988). All of these conditions were present in most Western countries at the time and with varying degrees of emphasis explain the continuing world-wide adoption of the EA process.

- *Record of Innovation*: Procedural and methodological developments have reinforced each other. They also have been product and cause of the shift toward broader, more integrative assessment. In particular, the EA process has taken on a stronger socio-political dimension while its scientific-rational basis has become methodologically diverse and specialized.

Public involvement has been a driving force as well as a hallmark of process development. In Canada, for example, public reviews have functioned as exercises in what Baber (1988) calls "procedural democracy". Contemporary EA is responsive to people and their concerns, providing a gradient of opportunities for different forms and levels of interaction (e.g., Roberts, 1995). In some jurisdictions, this involves the use of mediation as an integral part of assessment (e.g., Quebec and Ontario).

Box 2.8 Evolution of Environmental Assessment

	Examples of Process Innovations
Pre-1970	• project review based on technical/engineering and economic analysis • limited consideration given to environmental consequences
early/mid-1970s	• EA introduced ((NEPA, 1970) • basic principles; guidelines; procedures; including public participation • requirement instituted • standard methodologies for impact analysis developed (e.g., matrix, checklists, networks) • several other countries adopt NEPA-based approach (e.g., Canada, Australia, New Zealand) • major public inquiries (rather than court litigation) help shape their process development
later 1970s to early 1980s	• more formalized guidance (e.g., CEQ regulations) • use of EA by developing countries (e.g., Brazil, Philippines, China, Indonesia • SIA, risk analysis included in EA processes • greater emphasis on ecological modeling, prediction and evaluation methods • programme EISs prepared in US • environmental inquiries in several countries encompass policy review aspects • informational (non-hearing) provisions for public involvement • coordination of EA with land use planning processes (e.g., New South Wales, Victoria)
Mid-1980s to end of decade	• EC Directive on EIA establishes basic principles and procedural requirements for all member states • increasing efforts to address cumulative effects • development of follow-up mechanisms (e.g., compliances and effects monitoring, auditing, impact management • ecosystem and landscape level approaches applied (e.g., to assess wetland losses), • World Bank and other international lending and aid agencies establish EA requirements • increasing number of developing countries carry out EAs (e.g., Asia)
1990s	• requirement to consider transboundary effects under Espoo Convention • EIA identified as implementing mechanism for UN conventions on climate change and biological diversity • SEA systems established by increasing number of countries • mediation incorporate into EA requirements (still limited) • sustainability principles and global issues receive increased attention (some EA guidance but still limited) • increasing use of GIS and other information technologies • application of EA to international development activities more widespread • greater corporate use of EA, including screening investment and loan decisions, and undertaking site and property assessment to establish liabilities • rapid growth in EA training, networking, and cooperation activities • enactment of EA legislation by many developing countries

A large tool kit, containing 100 methods, facilitates better targeted scientific applications of the EA process for problem solving, though limitations on the use of many analytical techniques and requirements for their improvement are also well understood (e.g., Canter, 1995; Cassios, 1995). This is especially the case with respect to cumulative effects. Recent advances in information technologies promise to result in more structured approaches to assessment and in better aggregation of data and cross-referencing impacts (e.g., World Bank, 1993a; Julien, 1995). The latter aspect is still a critical shortcoming.

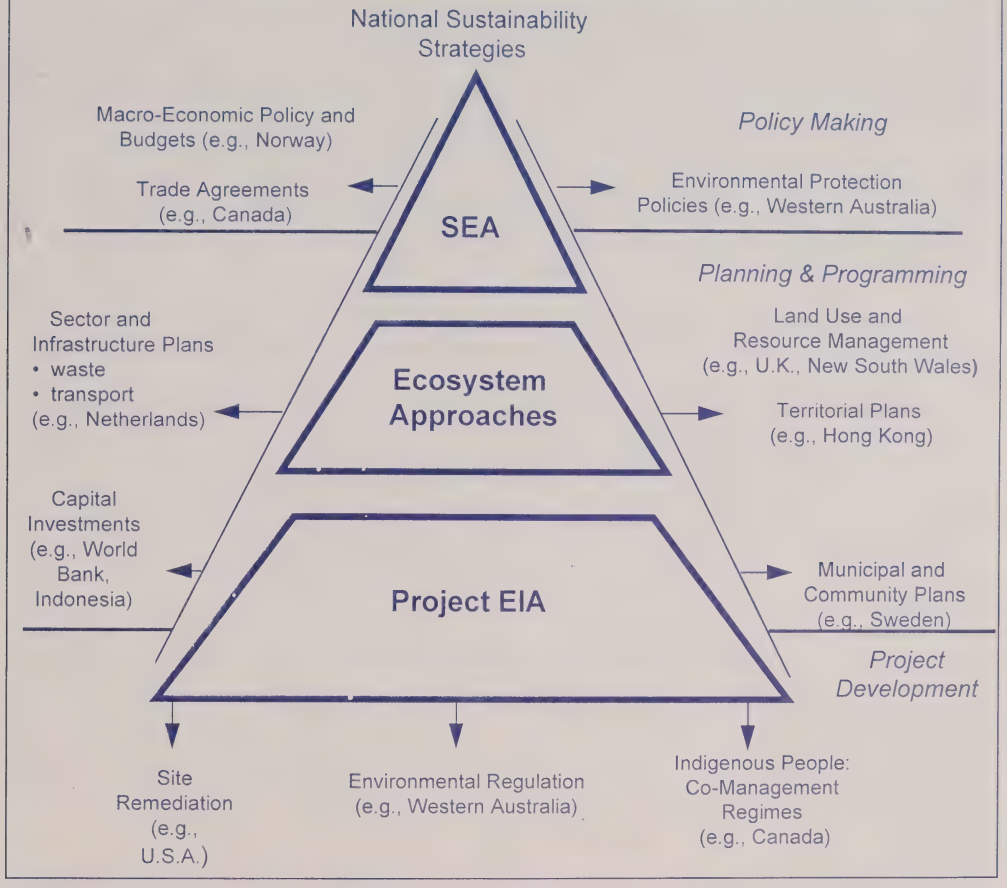
- *Extended scope of assessment*: EA is moving away from taking an "impacts only" focus relatively late in the project cycle, and toward approaches that are broadly-based, multi-stage, and "start to finish" in relation to decision-making processes. This shift is exemplified by the coverage given in EAs to:

    - an increasing range of environmental and societal impacts relevant to sustainable development, such as biodiversity and, at the international level, poverty alleviation and the role of women in ecosystem management (Goodland, 1995);
    - the higher levels of decision making, notably policies, plans, and programmes which are variously covered under the SEA systems recently established by a number of countries (e.g., Sadler and Verheem, 1996);
    - early application at the feasibility stages of the project cycle (e.g., World Bank, 1995); and conversely to facility operation and decommissioning (e.g., World Business Council on Sustainable Development, 1995); and
    - cumulative effects and other large scale changes, which are best addressed within an ecosystem context and a long-term timeframe (e.g., Leibowitz, *et al.,* 1992).

Figure 2.4 places these developments in perspective. In a number of jurisdictions, a strategic-level process is being built upon the well established platform of project EIA. SEA provisions and processes encompass both an EIA-based approach, scaled up to plans and programmes that fix the location of physical projects (e.g., US, Netherlands), and separate policy-level assessment procedures, (e.g., for Cabinet submissions and parliamentary bills as exemplified by the Canadian and Danish systems respectively).

The ecosystem approach, incorporating cumulative effects assessment, comprises a middle tier of Figure 2.4, linking EIA and SEA. Less well defined, this component is critical to taking a capacity-based, long-term perspective on impacts. In the US, the ecosystem approach is being developed as a cooperative inter-agency framework for resource management (US Inter-Agency Ecosystem Management Task Force, 1995). The approach provides a context under which cumulative impact analysis, as required by NEPA regulations, can be applied to better effect (see Clark, 1994). In Canada, cumulative effects frameworks and methods have been used in several major public reviews for waste project EIAs and as part of area-wide planning (e.g., Lawrence, 1994; Damman, *et al.*, 1995). A review of international experience with cumulative effects assessment found few examples of its explicit use outside North America (Court, *et al*, 1994).

Figure 2.4 : Integration of EA with Other Instruments and Processes



- *Toward an integrated approach*: An integrated approach is taken forward by the combination of the process developments reported above. The particular mix and emphasis that are applied in practice differ with national (or organizational) culture and the instrumental frameworks in place; (e.g., the strong technical emphasis of the Netherlands EIA Commission (1993), compared to the socio-political orientation represented by public hearings and mediations of the Quebec Bureau d'audiences publiques sur l'environnement). Of greater importance here is the type and level of integration that occur in these and other jurisdictions where EA is well established. Specifically, the continuing evolution of integrated approaches is evident at both the operational and structural levels, i.e., within the EA process and between the EA process and the broader systems of planning and management.

Within the project EIA process, taking account of social, economic, health, and other impacts is assumed to be routine practice. This statement, although accurate, requires qualification. Benefit-cost analysis and EIA remain relatively separate and unrelated process in many jurisdictions despite the evident importance of linking them (see, Sadler, *et al.,* 1995). Social impact assessment practitioners continue to express concern about the status of their specialization as a "second-class citizen" of the EIA process, and question the extent to which socio-cultural impacts are fully and systematically addressed (e.g., Beckwith, 1994; Finsterbusch and Gagnon, 1995). Recent reviews also indicate that health risks and effects tend to be given cursory study and that the results are not well integrated with other project impacts (e.g., Arquiaga, *et al.,* 1994). These constraints were recognized at many effectiveness study workshops and underline continuing requirements to achieve integrated project EIA (e.g., CEMP, 1994; see also Chapter 5).

At the systems level, the integration of the EA process within the larger decision-making process is being taken forward on several levels, as illustrated in Figure 2.4. These include:

- the incorporation of EA as an integral part of a comprehensive framework of environmental and resource management as in New Zealand;
- the formal institutional linkage of EA and land-use planning systems as in New South Wales and other Australian states;
- the coordination of EIA and SEA processes with a range of spatial and sectoral planning and management processes carried out in different jurisdictions;
- the targeted use of EIA elements as part of regulatory permitting; e.g., in the US for hazardous waste sites identified for clean up under "superfund" provisions.

In addition, the informal use of EA elements appears to be widespread. These aspects are not well documented and their role in rounding out formal EIA and SEA systems is possibly not well appreciated. However, they assume considerable potential importance in the context of sustainable development as all-encompassing processes that require changes in and by all sectors of society (Jacobs, *et al.,* 1993). A large box of assessment tools is incorporated in the environmental management systems of large companies (see Box 2.9). EA principles and tools are also widely used by local governments and communities and other sectors; to support urban planning (Doering, *et al*, 1991), community development (Rickson, *et al.*, 1995), indigenous resource management regimes (Sadler and Boothroyd, 1995), and interventions by conservation groups (Sidaway, 1991).

- *Sustainability Orientation:* Many of the steps taken as part of an integrated approach to EA fall within or are directed toward the agenda for sustainable development. Nearly 100 countries have prepared national sustainable development strategies -- or more accurately environmental policy or action plans (Carew-Reid, *et al.*, 1994). These "green plans" differ in aims, scope, and approach but typically provide a broad frame of reference for reconciling economic development with environmental protection. As a primary tool for this purpose, EA both serves as a catalyst to and is limited by the general level of commitment and progress made by a country toward meeting the minimum requirements set out in Agenda 21 for integrated environment and development decision making. In this regard, progress is proving slower than many hoped for, as indicated by the latest round of national

reports to the UN Commission on Sustainable Development (which, according to the *Earth Negotiations Bulletin* (1 May 1995) reflected an unwillingness or inability on the part of governments to alter their policies in accordance with Agenda 21).

Box 2.9 Assessment Tool Box Used by Industry

- EIA to assist facility siting and project authorization and inspection
- environmental and waste audits to improve processes and operations
- risk and life cycle assessment to design environmentally sound products
- SIA and public involvement to facilitate community and stakeholder relations
- full cost accounting to compare progress with other companies and maintain competitiveness

Source: UNEP, Industry and Environment, 1995.

2.2.4 Recent Changes to Legal and Institutional Frameworks

During the 1990s, there have been a number of important developments with respect to EA legal and institutional frameworks at both national and international levels. A synopsis of key developments is given below. This update also indicates both the scope and diversity of EA internationally and the difficulty of keeping abreast of current activities.

Changes to well-established EA regimes: Major reforms and overhauls to long standing EA processes have been completed (e.g., Canada, New Zealand), initiated (e.g., Australia) or are pending (e.g., European Commission EIA Directive). The *New Zealand Resource Management Act* (RMA, 1991) is possibly the most far reaching piece of sustainability legislation enacted by any country. EA is incorporated as an integral part of an effects-based approach to sustainability. It operates within the statutory planning and consent system rather than as a separate procedure, applies explicitly to projects and is indirectly specified for policy statements and strategic plans which local authorities are required to prepare to guide and implement sustainable resource management. Application at this level is variable and, overall, it is concluded that the unique way that EA is integrated into the Act makes evaluation of the effectiveness of implementation difficult (Dixon and Fookes, 1995.

The *Canadian Environmental Assessment Act* (1995) retains many elements of the previous Environmental Assessment and Review Process (1973), but entrenches requirements and procedures that were formerly administered under a Guidelines Order. Of particular note, are the addition of mediation as a means of public review of projects with potentially significant impacts, the provisions for public scrutiny and consultation at the self assessment stage of the process, and the establishment of a public registry of all screening and comprehensive studies.

EA legislation in developing and transitional countries: Post-Rio, many developing countries have enacted EA laws. This is one of the most striking and possibly under-appreciated trends in the field. Approximately 70 developing countries have EA legislation in place and a number of others are in the process of drafting new or amended statutes. Usually, provision for EA is incorporated within a framework environmental law which does not spell out the details of the process. However, there are also a number of recent EA-specific laws, decrees, rules, and

regulations (e.g., Nigeria, 1992; Paraguay, 1993; Uruguay, 1994). (See in Wilson, *et al.*, 1996; and Yeater and Kurokulasuriya, 1996.)

Countries in transition (CITs) in Central and Eastern Europe represent a special case with respect to EA process development. Some CITs have associate status with the European Union and are seeking to bring their EIA requirements in line with the EC Directive and the Espoo Convention (see below). A detailed survey of recent EIA legislation is available (European Bank for Reconstruction and Development 1994). However, CIT processes appear to be changing particularly quickly; e.g., the *Hungarian Environmental Protection Act* (1995) incorporating EIA regulations and a new Polish EIA Regulation (1995). Recent information on EIA in Central and Eastern Europe (and other developing regions) can be found in EIA Newsletter, 11, 1995.

Procedural strengthening by development banks and donor agencies: The European Commission and individual member states have strengthened their internal procedures for assessing development assistance activities. Other donor countries have made environmental sustainability a policy objective of their aid programmes and have introduced procedures for policy and programme assessment (e.g., Canadian International Development Agency [CIDA, nd.]. An OECD Development Assistance Committee Task Force (1994) has identified measures for improving consistency among EA policies, procedures, and practices of bilateral donors. The measures include the formulation of "Framework Terms of Reference" and a "Comprehensive Guideline" that respectively identify the principles and procedural requirements for sound EA (see CIDA, 1994).

Parallel developments have been taking place in and among multilateral institutions, including the World Bank, the African Development Bank, the Asian Development Bank and the European Bank for Reconstruction and Development.

The Espoo Convention on EIA in a transboundary context (1991): The convention is open to member countries of the UN Economic Commission for Europe. It was signed in 1991 by 29 countries and the European Commission but still has to come into legal force (by ratification of the sixteenth country). The convention stipulates the obligations of signatory countries to undertake assessment to prevent or reduce significant effects, particularly transboundary impacts. The main points to stress here are:

- the convention specifies principles and procedures by which the signatory countries will undertake assessment and notify and consult each other on listed projects;
- the projects, activities and thresholds to which the Convention applies are listed in an Annex to the convention;
- activities likely to cause significant adverse transboundary effects are to be assessed at an early planning stage;
- the procedure established by each country for assessment of these projects should provide for public participation, with foreign participants given the same opportunities as national residents; and
- the signatory countries have taken interim measures toward strengthening the institutional and methodological capabilities of signatories, especially countries in

transition, to comply with its articles. These measures recognize that in some countries, the EIA procedures included in the convention are not yet adequately reflected in national law and process.

Business and industry internal codes of practice: At the Second World Industry Conference on Environmental Management, the International Chamber of Commerce (1991) formally launched its Business Charter for Sustainable Development. The Charter comprises 16 principles of environmental management. Principle 5 calls for prior assessment of environmental impact "before starting a new activity...and before decommissioning a facility or leaving a site". About 800 businesses from more than 40 countries endorsed the charter in its first year (Willums and Göluke, 1992). In addition, industry associations have prepared codes of practice for environmental management and assessment and for their region specific application.

Recently, the World Business Council on Sustainable Development (1995) released an important statement on EA in industry decision making. Prepared by a Work Group representing a third of the Council's total membership and including some of the world's largest companies, the report emphasized that businesses today face a high penalty for failure to properly manage environmental impacts and risks. It also indicated how EA can help companies avoid costly loss of reputation and improve their profitability (see Box 2.10). Many multinational companies detailed have internal EA policies and operational guidelines in place (e.g., Shell International, 1994). Finally, the use of EA and related tools has become widespread in the financial services industry (see Box 2.11).

Box 2.10 A Business Perspective of Environmental Assessment

"Running a business encompasses a broad range of activities, not least of which is the management of potential risks associated with failure to handle environmental matters adequately. Industry does this by managing its environmental affairs with due care and by being increasingly eco-efficient, taking account of scientific, technical and economic factors, and the requirements of environmental legislation as a starting point.

At the heart of sound environmental management is the assessment of effects, real of potential, on the environment as a consequence of business activities and the planning and implementation of measures to avoid or mitigate that damage. Environmental assessments can assist companies in their quest for continuous improvement by identifying ways of maximizing profits through reducing waste and liabilities, raising productivity and demonstrating a company's sense of duty towards its customers and neighbors."

Source: World Business Council on Sustainable Development, 1995.

Box 2.11 EIA and the Financial Sector

UNEP, with support from Saloman Inc., has undertaken a survey of environment policies and practices of the financial services industry. The survey indicates, *inter alia*, that more than 80% of the companies polled perform some type of environmental risk management in the debt side of the business. The financial risks associated with environmental liability has become of major concern and environmental "due diligence" activities are of growing importance.

The following table shows the frequency with which the financial industry responding to the UNEP survey perform environmental credit risk activities. A six-point scale was used for this purpose (6=regularly, 5=often, 4=sometimes, 3=occassionally, 2=seldom and 1=never).

Average Response Activity		% of Respondents who regularly use the instrument
4.01	Environmental Impact Assessment	29%
3.98	Environmental Credit Risk Analysis or Audit	35%
2.99	Environmental Criteria for Credit Review	16%

Source: UNEP, 1995.

2.3 *Challenges to Contemporary Practice*

What stands out in the advances made to date in EA process development and adoption? Two aspects are of importance both in their own right and for their implications as to effective EA practice.

First, there is the widespread establishment of EIA systems by developing and transitional countries: These first-generation regimes meet the objective of Principle 17 of Agenda 21 which calls for countries to establish EIA as a national instrument for decision making. With one or two exceptions, policies and plans appear to be excluded from coverage. In most countries, the effective implementation of newly enacted EIA processes probably will depend in large measure on related capacity building and training needs being appropriately met (Abaza, 1994).

Recent experience in this area indicates that there is a number of issues to be addressed (e.g., Onorio and Morgan, 1995; Smith and Van der Wansem, 1995). These include concerns that many EA training and capacity building exercises are donor-driven rather than demand-driven. Better targeted programmes appear to be necessary to build the basis of sound practice in many developing countries, notably in Africa, the Middle East, and parts of Latin America that have recently enacted EIA laws but where practical experience is still limited.

Second, a next generation, multi-level EA process is emerging in a number of industrial countries: This integrated approach is built on formal EIA and SEA systems, with variable linkages to national planning and decision-making process depending on the institutional

management and traditions. At present, the framework outlined in Figure 2.4 is a composite picture rather than representational of its application in any particular jurisdiction. Integrated approaches as practiced begins to approximate, but does not yet correspond to, the integrated development planning and resource management frameworks that appear necessary to support decision making for sustainable development (for a review, see Jacobs and Sadler, 1989).

The case for integrated assessment and planning dates back to NEPA and well before. It forms a well argued theme in the literature (e.g., O'Riordan and Sewell, 1981; Rossini and Porter, 1983; Sadler, 1986; Furtado, 1988; Wathern, 1988; Smith, 1993; Brown and MacDonald, 1995). Various frameworks or models of integrated assessment and planning are promoted. However, these have many characteristics in common. Typically, the basis is the well established planning hierarchy: policy to define ends and give overall direction; strategic plans and programmes to establish alternatives and means of executing policy; and project design and implementation of activities. EA and related processes are seen as an integral component at each stage, scaled to purpose and applied to evaluate questions of whether, where, and what type of development will go forward as well as how projects can be built to minimize or avoid side effects.

Three overriding challenges emerge from these trends:

- *Challenge 1 is sharpening EA as a tool for sustainability assurance:* At the cutting edge of good practice, EAs can provide both guidance and example to the larger process of integrated decision making which is the primary component of sustainable development. This process can be extended by:

    - shifting the scale of assessment to focus on cumulative effects;
    - facilitating the use of more interactive forms of public involvement to "negotiate" risk and impact acceptability; and
    - incorporating assessment into all levels of decision making to get at the sources of sustainable development.

- *Challenge 2 is the practical application of the integrated, second generation EA process*: Although critical to meeting Challenge 1, this emerging approach is far more difficult to develop, implement, and standardize than its first generation counterpart. Key concerns include (Sénécal, 1996):

    - process coherence and manageability in light of the complexity and "exhaustiveness" of EAs;
    - cost effectiveness, especially at a time of public sector cut-backs;
    - lack of consensus regarding sustainability criteria and cumulative effects methodologies;

- *Challenge 3 is building quality control into the EA process*: This component is vital to bridge the gap between the reach of EA (Challenge 1) and the grasp of practice (Challenge 2). Quality control includes:

    - follow-up mechanisms that are a formal part of the EA process;
    - post-project analysis that provide a longer term retrospective on EAs; and
    - ex-post evaluation and effectiveness review of EA practice and performance.

2.4 KEY POINTS: SUMMING UP THIS CHAPTER

- *Importance*: EA is one of the most widely used tools for making development sustainable. It acts as a primary vector for introducing environmental considerations and a wider suite of environmental management tools into development planning and decision-making world wide.

- *Aims*: EA has three interrelated aims:

    - to inform and facilitate consideration of environmental effects and consequences in development decision making;
    - to ensure important ecological functions, and community values are maintained, consistent with sustainable development principles; and
    - to promote the optimal adjustment of forward development plans and policies to resource potentials and constraint.

- *Basic Principles*: These are well established and tested by over 20 years of experience. Drawing on participants' experience, the following are identified:

    - three core values on which EA is founded;
    - principles for design of EA process effectiveness; and
    - 21 principles for good practice implementation.

- *Evolution of EA*: A historical perspective on the field is revealing:

    - 20 years ago a mere handful of countries used EA;
    - now EA is used in more than 100 countries;
    - process adoption was especially rapid in 1990s;
    - significant innovation in law, procedure and methods;
    - new generation of international agreements, e.g.,:
        - transboundary EIA (Espoo Convention);
        - identification of EIA as implementing mechanism in climate change and biodiversity conventions;
        - specified as a principle in Rio Declaration; and
        - these trends underscore EA as a highly successful policy innovation.

- *Innovations*: Recent changes to EA legal and institutional frameworks include:

    - changes to well-established EA regimes;
    - EA legislation in developing and transitional countries;
    - procedural strengthening by development banks and donor agencies; and
    - business and industry internal codes of practice.

- *Challenges*: Challenges to contemporary practice are to:

    - sharpen EA as a tool for sustainability assurance;
    - apply integrated EA processes in a practical manner; and
    - build quality control into the EA process.

CHAPTER 3:
THE EFFECTIVENESS OF ENVIRONMENTAL ASSESSMENT

This chapter updates and exemplifies the approach taken to the review of EA effectiveness. It also provides, by illustration, an aide-mémoire on evaluation strategies and methodologies available for this purpose. The discussion is organized into three parts, focusing on:

- the framework for effectiveness review, including evaluation concepts and criteria;
- its application to different levels of EA practice; and
- case and reference studies that provided instructive findings likely to be of wider interest.

"Has environmental assessment achieved its goal of helping...reach better decisions? This is the fundamental question that all...practitioners must begin to address systematically."
Dorais, (1993,1)

A concern with effectiveness is an overarching and integral theme of EA theory and practice. Numerous professional judgments are made everyday by EA specialists about how well procedures and activities are working. Critical analysis of the state of the art of EA, in general, and its application in particular countries and circumstances, also forms an integral part of the literature of the field. In recent years, increasing attention has been given to systematic approaches to evaluate the performance of EA processes, including the fundamental contribution to decision-making as specified by Michel Dorais above. His statement, made to IAIA' 93 Shanghai, formally launched the current study.

The intent of the effectiveness study was to promote studies by participating countries that were of direct value to them and of wider interest to others. In this context, the draft framework prepared for phase two of the study outlined a broad approach to the evaluation of EA effectiveness that encompassed the overall process, its contribution to decision making, and the key components and relationships necessary for successful performance (Sadler, 1994). A number of studies and diagnoses, consistent with this general approach, were contributed by agencies and individuals. These collectively highlight important aspects of the quality of assessments in different jurisdictional and geographical settings, and, in response to Dorais' challenge, provide practical perspectives on whether and how the EA process makes a difference to decision making and implementation of environmental protection measures. Other comparable and parallel studies which contain additional information on the subject also can be noted (e.g., Devuyst, 1994; Lee, *et al*, 1994; Verheyen, *et al*, 1994; Wood, 1995).

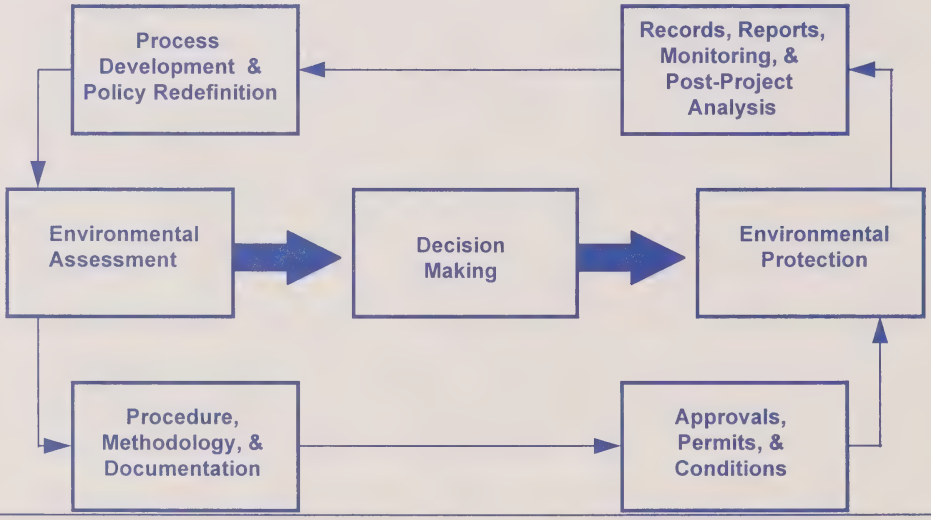
Put simply, the term "effectiveness" refers to whether something works as intended and meets the purpose(s) for which it is designed. In the case of EA, the overall evaluation of performance is undertaken by reference to the policy and institutional functions it is meant to serve. An EA process can only be fully understood and comprehensively evaluated in relation to the national or jurisdictional framework of decision-making within which it operates, e.g., NEPA in its entirety in the case of the USA (US Council on Environmental Quality, 1995). The litmus test of successful performance in this context is the extent to which better decisions follow and

whether environmental objectives are realized. Figure 3.1 summarizes the axial relationship of EA, decision making, and environmental protection:

The review of EA effectiveness is context specific, although, as noted in Chapter 2, most or all processes have sufficient features in common to allow for comparison. In all cases, evaluation of performance and judgment about success will be subjective, and subject to the following qualifications

- the EA process operates in an open ended, decision-making context;
- it is taken forward and influenced by the actions of numerous participants;
- the outcomes of the process are not always clear or apparent;
- in these circumstances, cause-effect relations cannot be measured or quantified; and
- often, proponents and opponents of EA differently interpret the utility of the process.

Figure 3.1: Environmental Assessment, Decision Making and Sustainability Assurance: Key Relationships and Elements



3.1 Effectiveness Concepts and Dimensions

A number of alternative perspectives and frameworks can be used to evaluate the effectiveness of EA. One model that is widely followed in the literature is to compare EA "theory" and practice, i.e., contrasting what *should* be done according to established norms of law or science with what *is* done, either in general or within a particular jurisdiction. This prescriptive approach, at best, helps to set standards and raise sights, especially with regard to the procedural and methodological aspects of EA. However, these aspects are necessary rather than sufficient building blocks of effective process and are most usefully examined in the larger context of decision making referred to previously. Policy and programme evaluation methodologies, widely used in government, can be applied to gain such a strategic, process-wide perspective (see two special editions of *Impact Assessment Bulletin* 6(3/4), 1988; 7(2/3), 1989).

The organizational framework illustrated in Figure 3.2 borrows from these sources. It schematically illustrates the evaluation cycle for gauging overall effectiveness. A triangulation test is applied for this purpose. The focus is on relating policy to practice to performance, and relating the implications of performance back to policy adjustments and process development. Key questions and perspectives in evaluating the EA process and its relationships to decision making are identified, recognizing that many aspects of success can be appreciated only after authorizations are given and proposals subjected to EA are actually implemented. These interconnected stages from pre-to-post decision-making represent the equivalent of a "life-cycle approach" to EA effectiveness.

In this context, the relevant forms or types of EA effectiveness review will differ at the interim checkpoints identified in Figure 3.2. The main distinctions, in terms of the purpose and yardsticks of evaluation are:

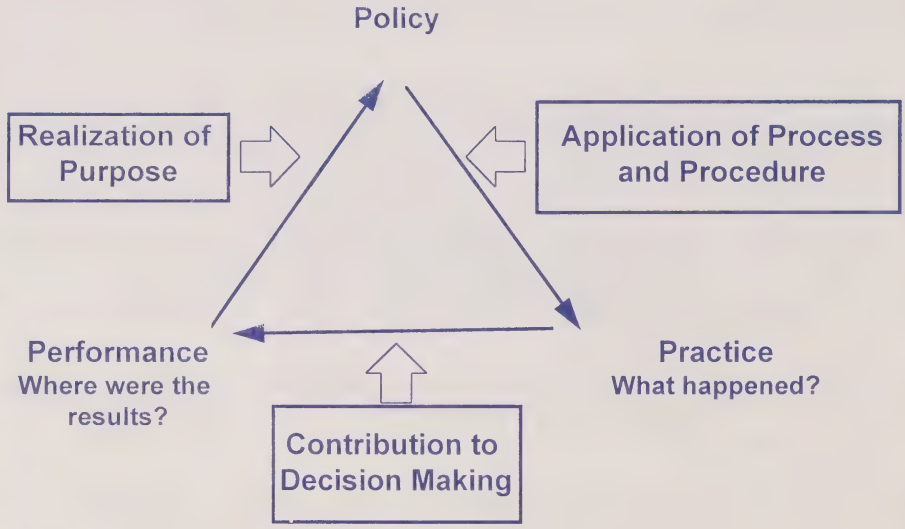
- *procedural*: - does the EA process conform to established provisions and principles?
- *substantive*: - does the EA process achieve the objectives set, e.g., support well informed decision making and result in environmental protection? and
- *transactive*: - does the EA process deliver these outcome at least cost in the minimum time possible, i.e., is it effective and efficient?

As indicated in the draft framework of the effectiveness study, evaluation of EA performance can take place on a number of different levels (see also Ortolano, 1993; Lee, *et al.* 1994). These are:

- *system-wide reviews* of EA experience, activity, and outcomes, e.g., number of EISs or equivalent reports processed over a given period of time, the overall results in terms of decision making, and the extent to which these supported policy or institutional goals;
- *decision audits* of the application of the EA process from start to finish in one or a number of test cases, e.g., as applied in the Netherlands to evaluate and compare the use of EISs in a number of permitting and planning approvals (see Folio 3.2); and

- *activity or component-specific evaluations* of particular stages or components of the EA process. This approach can involve either a "step by step" analysis as part of a division audit or a separate exercise, e.g., to review EA for:
  - procedural compliance with requirements
  - completeness and quality of EA documentation
  - adequacy of methods used to assess impacts or involve the public (see examples discussed in Folios 3.2 to 3.8).

Figure 3.2: The Effectiveness Triangle



Examples of all of the above types of approaches are incorporated in the effectiveness study, and selected case studies can also be found in the Folios at the end of other chapters. These contain important information and insights on aspects of EA effectiveness in different countries and situations, and also elaborate on tools and methodologies for review. It must be emphasized that sources of information for evaluation of EA effectiveness are not usually readily available, and considerable investment of time and effort is required to purpose-build approaches. This is especially the case with respect to monitoring and follow up data on impacts and the success of mitigation and other management strategies. Such information is critical to making balanced judgments about substantive performance and cost-effectiveness. Yet it is often absent and very difficult and time consuming to reconstruct after the fact.

3.2 *Principles of Review*

The purpose of EA effectiveness review is problem-solving rather than fault-finding. It is directed toward process development by highlighting the means for improved quality control and the basis for better practice and management. Four principles of evaluation are elaborated below which can assist the application of this approach and the use of results. These also underpin the examination which is given in this study to contributed work from various sources.

Place problems in their true perspective. Many challenges are known to confront EA practice. When itemized separately, from a reading of the critical literature, the list of problems can easily become long, daunting, and potentially misleading in the absence of reference to the larger context and realities to which the process is addressed. These include:

- the spatial order at which many environmental risks and impacts are now expressed, e.g., cumulative, large scale changes;
- the limitations imposed on prediction and other activities by the contributing sciences, e.g., ecology (Treweek, 1995), sociology (Burdge and Vanday, 1996); and
- the systemic constraints established by the larger policy and institutional regime under which EA operates (e.g., Ortolano and Sheppard, 1995)

These questions are addressed further in the survey of IAIA members (Chapter 4) and considered with respect to specific issues of practice in EIA, SEA and ESA, respectively, in Chapters 5, 6 and 7. For present purposes "best case" and "worst case" report cards on EA can be prepared from examples and findings in the literature (see Box 3.1). In general terms, however, five main problem areas are associated with the EA process:

- *attitudinal* - proponents and development agencies resist or circumvent EA or apply it as a pro-forma or narrowly technical exercise;
- *structural* - EA is not sufficiently integrated with decision making, notably at the project preparation phase or with other supporting policy, planning and regulatory processes;
- *institutional* - the scope of EA is too narrowly defined or applied, such that social, health factors and cumulative effects are inadequately covered;
- *procedural* - there is inadequate guidance and inconsistent enforcement of the EA process leading to "user" complaints about fairness, timeliness and efficiency; and
- *technical* - the quality of EISs, the accuracy of impact predictions, and the suitability of mitigation measures are often highly variable, even in relatively mature, advanced EA systems.

Box 3.1 Alternative Report Cards on EA

Best Case Performance

The EA process:

- facilitates informed decision making by providing clear, well-structured, dispassionate analysis of the effects and consequences of proposed actions
- assists the selection of alternatives, including the selection of the best practicable or most environmentally-friendly option
- influences both project selection and policy design by screening out environmentally unsound proposals, as well as modifying feasible action
- encompasses all relevant issues and factors, including cumulative effects, social impacts, and health risks
- directs (not dictates) formal approvals, including the establishment of terms and conditions of implementation and follow-up
- results in the satisfactory prediction of the adverse effects of proposed actions and their mitigation using conventional and customized techniques
- serves as an adaptive, organizational learning process in which the lessons experienced are feedback, into policy, institutional, and project design.

Worst Case Performance

The EA process:

- is inconsistently applied to development proposals with many sectors and classes of activity omitted
- operates as a "stand alone" process, poorly related to the project cycle and approval process and consequently is of marginal influence
- has a non-existent or weak follow-up process, lacking surveillance and enforcement of terms and conditions, effects monitoring, etc.
- does not consider cumulative effects or social, health, and risk factors
- makes little or no reference to the public, or consultation is perfunctionary, substandard and takes no account of the specific requirements of affected groups
- results in EA reports that are voluminous, poorly organized, and descriptive technical documents
- provides information that is unhelpful or irrelevant to decision-making
- is inefficient, time consuming and costly in relation to the benefits delivered
- understates and insufficiently mitigates environmental impacts and loses credibility

Recognize judgments about effectiveness are relative. EA is a plural process that is shaped by the interaction of many players. Their perspectives on how well EA works vary, reflecting different roles, backgrounds and past experiences. A multiple-perspective approach is necessary to gain a full appreciation of process effectiveness, with sufficient cross-checking to ensure consistency and representativeness. Overall, however, the traditional perspectives of key participants are well known, and often break down along "proponent" versus "opponent" lines: developers and development agencies are concerned about time, cost, and uncertainty of EA and seek a minimal process, while affected communities and environmental interest groups, concerned about the substantive role of EA in altering proposals and influencing decision making, seek a maximum process.

At the 1994 International Summit on EA, senior managers spent considerable time discussing how to reconcile the conflicting expectations and perspectives of users (see Box 3.2). This is a critical and under-recognized challenge of maintaining process viability and credibility, as is coordination of technical analysis, public consultation and inter-governmental responsibilities in relation to decision making. Within the impact assessment profession, there are also different paradigms for evaluating success; for example, the scientific and political models respectively emphasize EA as a rational, objective process of analysis and as an approach to incorporate the values and concerns of affected communities and promote their consideration in decision making. In practice, as noted in chapter 2, these are variously amalgamated, but the explicit application of one or the other gives a very different reading on effectiveness (Canadian Environmental Assessment Research Council, 1986).

Box 3.2 The Challenge for EA Managers

"Typical EA systems consist of three levels: decision-makers, managers and practitioners and the public. EA managers recognize that each level has different, and often conflicting, expectations and perspectives:

- *Decision-makers* see a process that sometimes takes too long, that seems to cost too much, that appears unnecessarily complicated, and that in the end, does not always give them the kind of information they need to make a sound decision.
- *Managers and practitioners* see a process where the results of their work are not always taken into account in the final decisions, and where they do not always have the time and resources to do an adequate job.
- *Members of the public* see a process that may exclude them from participating in decisions that affect their lives and communities, or that may provide massive volumes of complex scientific data but few straightforward explanations".

Source: Final Report, *International Summit on Effectiveness Assessment,* 1994.

Specify criteria for evaluation. The identification of performance indicators and measures for evaluating the effectiveness of the EA process will reflect the level and focus of review. Useful descriptions and questions for this purpose can be found in Folios 3.2 to 3.8. For this study, a qualitative set of effectiveness attributes have been developed. These are briefly described below and elaborated by a comprehensive checklist of questions in Folio 3.1 (which may be of wider use as a basis for evaluating the effectiveness of the EA process).

Ensure relevance for decision making. The test of relevance involves estimating the usefulness of the EA process for the decisions made at various stages of proposal development as well as for formal approvals. Key issues are:

- *the quality of the information products* delivered by EA, e.g., was the final report timely, relevant and focused on the issues?, and

- *the degree of influence of EA* on the choices made, e.g., did the terms and conditions take into account the information supplied and advice given? and, equally important, was a balanced decision reached in which environmental, economic and social considerations were appropriately weighted given the circumstances? (Such judgments, of course, are highly subjective).

Meet enabling conditions of sound performance. The quality of the information provided can be linked back to the integrity of the process. Effectiveness will reflect the interaction of two interrelated components of an EA system:

- *appropriate institutional controls* that provide formal structure and direction to assessment. These are summarized by the design principles outlined in Chapter 2. Certain factors, such as legal requirements for EA, scoping, and reporting procedures and provision for external review (expert, judicial, and public) are considered to be particularly important for quality control and to provide administrative incentives to sound performance (e.g., Kennedy, 1988; Ortolano, 1993; Wood, 1995); and
- *adequate operational competence* in the "3r's" of EA practice applied at each stage of the process, as shown in Figure 3.3. The "3r's" of good practice comprise: (Sadler, 1990)

    - rigorous analysis -- application of "best practicable" science to the nature and scope of the issues and impacts;
    - responsive consultation -- the "appropriate" use of techniques and procedures, i.e., for the issues and in relation to the affected communities;
    - responsible administration -- timely, consistent and adaptive implementation of provisions and principles, without bias or favor to or against parties.

Figure 3.3: Matrix for Evaluation of Operational Preference for Key Stages and Activities of EA Process

	Technical Analysis	*Public Consultation*	*Process Administration*
Screening *Scoping* *Prediction* *Significance evaluation* *Mitigation* *Monitoring* *Implementation* *Audit* *Evaluation*			

Deliver environmental and other benefits cost effectively. In the final analysis, the effectiveness of EA is measured by its "downstream" contribution to modification of proposals and the implementation of management plans which result in successful reduction, avoidance, and mitigation of adverse environmental effects. Other direct and indirect policy benefits may be

attributable to the EA process as described in the next section. Ideally, an estimate should be made of whether the environmental benefits were delivered at either the least or a reasonable cost, although the methodologies for this purpose are still unsatisfactory and interpretations will be circumstantial (see Lee, *et al*, 1994).

As far as possible, use or adapt robust, generic methodologies that can be applied widely and/or allow for comparison. Standardized methods and tools for evaluating EA effectiveness are not well developed. By far the greatest attention to date has been directed at three types of extended follow-up studies to the EA process: These are:

- auditing impact predictions to determine their accuracy (e.g., Buckley, 1989; Bailey and Hobbs, 1990; Culhane, 1993);
- review of the quality of EISs/EA reports (e.g., Lee and Dancey, 1993; Glasson, *et al*, 1995); and
- post-project analysis or retrospective assessment (e.g., UNECE, 1991; Boothroyd, *et al*, 1995).

Only review checklists as used in the UK and certain other EC member states to examine EISs/EA reports appear to be reasonably comparable (see Folio 3.5).

For wider scope evaluation of the EA process, there were no frameworks that could be located at the beginning of the effectiveness study. Work begun under an action-prospectus for this area prepared by the Canadian Environmental Assessment Research Council (1988) proved helpful in preparing a draft note on case studies and decision audits. The evaluation checklist outlined in Folio 3.1 has drawn from a number of sources and inputs that exemplify different dimensions of review. These include:

- comparative frameworks examining the effectiveness of EA system that, inter alia, helps to screen for the appropriateness of institutional controls, and review key stages of the EA process (Wood, 1995; Doyle and Sadler, 1996);
- pilot studies of the effectiveness of EIA for decision making in the Netherlands (van de Gronden *et al*, 1994); and
- efficiency and compliance audit procedures developed in Australia at both state and the Commonwealth (Sippe, 1994a).

3.3 Making a Difference: The Value Added by EA

Several countries participating in the effectiveness study have taken a close look at the record of EA in facilitating decision making and supporting environmental protection. In each case, contributors have been able to supply information on trends and experiences with recent performance on this front. Some partner agencies have used formal evaluation frameworks and methodologies for this task as summarized in Folios 3.2 to 3.8. Others have prepared specific case studies on decision audits, or used a combination of "success stories". What comes through is a clear indication that EA can and does make a difference to decisions taken and that it supports environmentally favorable actions in implementing development.

In this section, the focus is on the value added by decision making, and on the reasons why success appears to be achieved in some cases but not in others. Much of the evidence is circumstantial and limited to a very small sub-set of EA practice, and should be considered illustrative only. However, it should be noted also that some of the sources drawn on represent considerable work by the countries concerned.

3.3.1 Macro Reviews of National and International Experience

Few comparative evaluations of the overall performance of EA systems have been undertaken. This approach can be useful to identify relative strengths and shortcomings with respect to the enabling conditions of sound performance (i.e., institutional and procedural controls) and to the centrality of EA to decision-making. A brief snapshot of the main points derived from six macro studies are given below. This provides a context for further process-specific review.

Multi-lateral perspective. Wood (1995) reviewed the effectiveness of EA systems in six countries and two states, including those considered to have the strongest institutional arrangements, and rated them against 14 evaluation criteria. The results were also compared with selected developing countries. For present purposes, two findings are of interest:

- the Western Australian, Netherlands, US (federal and California) and Canadian systems - in that order - all scored relatively high (meeting all or the majority of criteria) and, not surprisingly, their general controls and safeguards relevant to decision making are much higher than in developing countries;
- only Western Australia and the Netherlands were considered to fully meet the criterion that "the findings of the EIA report and the review be a central determinant of the decision on the [proposed] action".

At the 7th tri-partite Australia-Canada-New Zealand Workshop on EIA, a comparative review of experiences also concluded that review and quality control of EIA documentation are "crucial ingredients for provision of relevant information of decision making" (Anderson and Sadler, 1996). However, the correspondence is not necessarily one-to-one as subsequent discussion indicates, precisely because institutional controls act as *general* checks and balances. Proposal-specific relationships to decision-making will be more flexible and circumstantial.

Review of the implementation of the EIA directive in member states of the European Union. A comprehensive five year review was undertaken by the Commission of the European Communities (1993). Several across-the-board conclusions deserve mention:

- with certain political exceptions, all members had met the requirement to subject Annex I (large scale) projects to EA;
- there was considerable variability with respect to coverage of Annex II proposals and in the extent to which threshold levels were applied to the same sub-category;
- substantial increases were recorded in the annual number of EISs in most member states, but with wide variations;
- several areas of concern remain in regard to formal compliance (e.g., taking account of environmental information on consultation in decision making); and

- projects approved as a result of EIA are better planned and designed from the environmental point of view, though these influences were not as widespread as intended and most modification to proposals were classes as minor.

Attributes of effectiveness in Canadian jurisdictions. A comparative review was undertaken of the federal (1), provincial (10) and territorial (2) EA systems in Canada (Doyle and Sadler, 1996). This involved examining the overall frameworks in place against 18 institutional and 11 procedural characteristics considered by Canadian EA Administrators to be important "quality controls". On this basis, ten key attributes of effectiveness for Canadian systems were established, and each administrator used a set of rating criteria (see Figure 3.4) to develop a jurisdictional profile. These so-called "EAOGRAMS" are self-diagnoses of system effectiveness and identify the extent to which safeguards are in place to provide the basis for EA to have a positive influence on decision making.

With respect to the contribution of EA to decision making, nine of the Canadian jurisdictions grant approvals on the basis of EA, and an acceptable EIS is mandatory for this purpose in all but one of these cases. The federal system, *pace* Wood, does not issue approvals but does require clearance that proposals subject to comprehensive study and public review have no significant adverse environmental effects "that cannot be justified in the circumstances". The Canadian country status report prepared for the effectiveness study also notes that decision makers are treating the EA process and its results "more seriously". A number of Canadian case studies and decision analysis document specific contributions of EA to more informed, cost-effective choices. (See Box 3.3)

Box 3.3 Canadian Environmental Assessment -- Recent Achievements and Challenges

Achievements:
- entrenching legal requirements
- policy and programme assessment
- integrating environmental considerations into project planning and design
- use of innovative approaches to dispute settlement
- providing better information to decision makers
- improved methodologies for EA, e.g., scoping, cumulative effects, follow up

Challenges:
- managing increasing complexity
- budgetary and financial constraints
- privatization and increased emphasis on non-regulatory measures
- Process and regulatory strengthening, e.g., completing federal-provincial harmonization agreements, ratifying the Espoo Convention

Source: CEAA, 1996.

Figure 3.4

Attributes and Dimensions of EA Reference with Particular Reference to Canadian Process

Attributes \ Dimensions	A	B	C	D	E
1. Clear Purpose and Goals/Direction	No Written Guidance	Policy and Procedures	Law, Policy, and Procedures	Administrative Practices	Day-to-Day Problem Solving
2. Incorporates Long-Term and Overall Perspective	Bio-physical and Project Specific	Biophysical and Socio-Economic Project Specific	Interjurisdictional Considerations	Cumulative Effects, Biodiversity	Sustainability Considerations
3. Broad Scope of Application	EA on Large Projects Only	Process matched to Significance of Effects	Large and Small Projects	Projects, Plans, and Programs	Strategic EA
4. Responsive to Public/Stakeholder Involvement	Information Dissemination	Consultation	Limited Participation	Broad Participation and Dispute Resolution	Principled Negotiation
5. Interjurisdictional Harmonization	EA Agency Acts Alone	Within Jurisdictional Harmonization	Principles applied to External Jurisdictions	Interjurisdictional Agreements	International Conventions Applied
6. Monitors Results and Responds to Findings	Relies on Complaints only	Proponent reports periodically	Independent Sample Audits	Broad Compliance Monitoring	Broad Monitoring and Response
7. Certainty of Decision Making	EA Input Optional to Decision Maker	EA Input Mandatory to Decision Maker	Limited Scheduling of Activities	Detailed Scheduling of Activities	Legal Recourse for proponents
8. Living Process	Incorporates New EA Technologies	Incorporates EA Technologies and Public Involvement	Incorporates Changing Community Values	Responds to Improved Institutional Capacity	Can Respond to All of the Proceeding Items
9. Provides Value for Money	Costly and Time Uncertainty		Moderately Efficient in Cost and Time		Cost-Effective Time Efficient
10. Achieves Environmental Sustainability	Benefits not Evident to most		Benefits Evident on Large Projects		Benefits Readily Apparent

Source: Doyle and Sadler, 1996

Second (Five Year) review of the EIA regulation in the Netherlands. Since it was established in 1987, the EIA regulation which covers the content of the EIS, procedural safeguards, and links to decision making, has been subject to two formal reviews by the independent Evaluation Committee. The first review in 1990 found that the EIA regulation was "working reasonably well" and "contributes a substantial amount of information...to the decision making process and streamlines existing procedures in many cases" (Netherlands, Evaluation Committee, 1990). Overall strengths and weaknesses of the Dutch EIA system as determined by practitioners are identified in Box 3.4. Recently, the committee conducted its second review, focusing on the influence in EIA on decision making, with a distinction between:

- actions or concrete modification to the original project of plan;
- images or perceived effects, such as greater attention to alternatives, included cooperation among parties involved in decision making; and
- broad influences of EIA, e.g., what the parties involved learned from the experience for future projects and plans.

The results of the second review were telling. In 52% of the decision-making processes reviewed, EIA modified the plan or project itself (influence on actions) and in 68% of all processes, EIA influenced parties involved in decision making (influence on images)[2]. Overall, EIA influenced either actions, images or both in 79% of all decision making processes. In addition, in 71% percentage of all decision-making processes the parties involved considered there had been a broad influence of EIA on decision making, i.e., the environmental information collected would influence their actions in the future. With regard to the influence of EIA on decision-making in relation to the time and money spent, 29% judged this influence as negligible, another 29% as small, 26% as reasonable and 14% considered this influence as major.

[2] A conservative methodology was used to evaluate perceived success of EIA on decision making. It consisted of interviewing all parties involved in over one hundred EIA processes on their perception of the extent to which one or both types of influence has taken place. Only in cases where proponent and competent authority shared the same vision, backed by the majority of other parties involved (e.g., independent advisors and the public) was an EIA process scored "positive" in respect of influencing the decision making process. The majority of experts interviewed were civil servants or technical experts.

Box 3.4 EIA in the Netherlands -- Perspectives of Administrators and Practitioners

Strengths and Assets of the Dutch System include:

- based in law and applicable to all jurisdictions
- also flexible and allows for innovation
- provision of independent review
- guidelines provide a framework for review
- produces an adequate set of alternatives, including the most environmentally
- friendly option
- results in the application of mitigating measures

Areas of improvement within the present system include:

- greater focus on key issues in scoping process (guidelines needed)
- tailoring the EIS to decision-making requirements and licensing documents to technical details and conditions
- clearer identification of EIS information in the decision-record
- applying EIA to the strategic level of decision making
- linking the planning and EIA processes
- earlier start to EIA procedure
- assessment of public health and cumulative effects

Source: Netherlands-Canada EIA Workshop, December 1994

Effectiveness and efficiency of the NEPA process. The US Council on Environmental Quality (CEQ) (1995) has undertaken a major review of the strengths and weaknesses of the implementation of NEPA focusing on the environmental impact statement (EIS) and EA processes. Three major trends have been identified:

- the increased use of EA instead of EIS to meet NEPA requirements, often for relatively large projects which approach thresholds of significance;
- consequent widespread use of "Mitigated-Findings of No Significant Impact (FONSI)", i.e., involving major mitigation commitments to bring the potential adverse effects below the significance thresholds that will trigger an EIS; and
- significant decline in NEPA litigation, with most lawsuits filed over alleged circumvention of EIS requirements.

As the CEQ (1995) notes, there is nothing wrong, in principle, with the use of "mitigated-FONSIs". Indeed, some consider it an indication of NEPAs success -- integrating environmental values into agency decision-making at lower cost and with less paperwork (although the average cost of preparing an EA for a mitigated-FONSI is $31,192 compared to $1240 for a conventional EA). Others claim that mitigated-FONSIs, especially for larger projects, do not meet the principles and purpose of NEPA, e.g., in some cases, by not allowing for interagency and public review or not undertaking monitoring to determine whether the mitigation strategy was effective.

Government-wide, however, the effectiveness review found that NEPA was working well (see Box 3.5). The list of successes includes reference to "the standard framework of decision making" that is now in place for all agencies and ensures compliance with NEPA is integral to activities.

Box 3.5 NEPA -- What Works and What Needs Work

Successes:
- public involvement in decision making
- standard framework of decision making
- better coordination of federal projects
- better understanding of ecosystems
- environmentally sound federal actions

What needs work:
- integrated environmental review
- monitoring programmes
- better public inclusion
- necessary baseline data
- earlier start on analysis
- more rigor in analysis

Source: US Council on Environmental Quality, 1995.

Assessing UK performance in EA. Previous studies or the quality of environmental statements undertaken by the EIA Centre, University of Manchester, were used as a basis for examining the proportion of projects that underwent modification as a result of the application of the EA process. The review noted that strict comparison of the results was not possible because of differences in project samples and data sources. But overall, the combined results indicate that (Lee, *et al*, 1994):

- possibly 50% of the projects underwent environmentally positive modifications;
- only in a small proportion of cases were the environmental changes considered to be major;
- the rest were given various classification, e.g., minor, to moderate change/fairly significant, materially altered;
- some modifications might have taken place in any case;
- most project changes appear to take place during the later stages of the EA process; and
- for projects with a relatively long lead time, most modifications occur prior to finalization of the EIS.

3.3.2 Micro or Process-Specific Review

The emphasis here is on how the EA process makes a difference to decision making, what constitutes relevance in practice, and which stages and activities are relatively most effective in meeting this criterion. A "common judgment" framework was prepared for this purpose and discussed at the EIA Process Strengthening Workshop at Canberra. Four questions are posed to review the degree of success of EIA with respect to decision-making (following the amended version by Scholten, 1995):

- What is the value added to decision making by EA?
- Which factors are important in determining this added value?
- Which key safeguards control these factors and can be used to improve the contribution of EA to decision making?
- How do the benefits and costs of EA stack up against each other?

Added Value

The relevance of EA for decision-making -- its bearing on the issues at stake -- is the first line of adding value. By providing information on the problems that matter, EA can play a critical role in the decision-making process. Other criteria, such as reliability and actionability of the information, are also important in reinforcing the potential "standing" of EA at the Cabinet table or other decision forum. In the final analysis, of course, environmental conservation must be balanced with economic, technical and other factors in final approvals and condition setting. This is a separate consideration that bears closely on the effectiveness of implementation.

Based on decision and case studies in this report, a number of ways can be identified in which EA exerts an observable, positive influence on decision-making, leading to a greener or more environmentally acceptable actions (see Box 3.6). These influences are both direct and indirect. In many cases, other factors also play a role, such as economic cycles, political events, etc. With few exceptions, it is very difficult to unambiguously ascribe influence to the EA process.

Preemption or early withdrawal of unsound proposals: is widely considered to take place, though, not unexpectedly, it has proved difficult to document. At the World Bank (1995), environmentally damaging components are reported to have been halted at the screening stage. More positively, sectoral and regional EAs also provide flexibility to weed out environmentally unsound sub-projects and to set aside areas worth saving.

Support for and confirmation of positive environmentally sound proposals: In a number of cases, EA is used to identify site and to develop management plans for protected areas and other conservation options. The former is primarily applied to zoning and equivalent ecologically-based park and are reserve systems; the latter are directed more toward the integration of conservation values and set aside as part of a larger natural resource management scheme. Many practitioners note that the latter present problems because agricultural, fisheries, forestry, and other specialists consider their projects as environmentally positive and so, by definition, do not require an EA.

Cancellation, postponement or redirection of environmentally damaging proposals. Only a very small fraction of proposals are halted, permanently or temporarily, as a direct result of EA at the end of the review process. "No go" recommendations or rulings are exercised sparingly as a "last resort" in some systems (and not used at all in others). Their application means that, to some degree, other checks and balances in the EA process have not operated successfully. In most cases, the circumstances of a "no go" recommendation will be controversial in the light of EA as one input into a balanced decision-making process.

Greening or environmental improvement of proposed activity. By far the largest majority of the value added by EAs falls into this category. Much of it, to be sure, represents routine inputs to planning and design ensuring impacts are avoided, mitigated, and minimized as far as practicable. However, the net direct benefit to environmental protection and community welfare is considerable and possibly undervalued by many. In some cases, assessments have resulted in projects, plans and activities being carried out in a significantly lower-impact form than originally proposed, while still meeting their development objectives and sometimes with large cost savings over budget.

Indirect benefits of EA. There is various evidence of EA having a range of indirect benefits, i.e., that are not transmitted directly into decision-making on proposals subject to review. In general, these are of two types -- instrumental and educational. An example of the first category is policy or institutional adjustments being made as a result of EA experiences bringing to light certain deficiencies or gaps that should be addressed. This is often a feature of EA Panels in Canada (e.g., Sadler, 1990; Folio 3.6.). Secondly, the EA process is widely credited with being a learning process in which participation leads to positive changes in environmental attitudes and behavior (see Chapter 4). Such effects are difficult to measure and there appear to be few or no longitudinal surveys on this subject.

Recently, the Netherlands EIA Commission documented five indirect benefits of assessment that also assist decision making more generally or in the future (Scholten and van Eck, 1994):

- *identification of future solutions*: e.g., EIS of a mineral oil refinery indicates that use of a cheaper fuel oil compared to natural gas meets current standards but also shows that more stringent industry-wide rules would substantially reduce SO2 emissions;
- *improvement of regulations*: e.g., EIS of airport runway found deficient because noise target volumes for sleep disturbance are insufficient, and a supplementary study initiates a process for developing new national standards;
- *impetus to structural research*: EIAs of activities that emit toxic substances indicate the health risks and impacts are difficult to define, particularly the case of multi-source exposure, leading to a new research programme on this subject;
- *internationalization of environmental awareness*: These results are illustrated by the internal use of EIA by major companies and government agencies (e.g., Public Works Office) and possibly, are further shown in their more constructive role in the formal EIA procedure; and
- *objectification and streamlining*: The time taken for EIA reviews of waste incinerators in relation to dioxin problems has been reduced from six years to one based on stringent

criteria and independent review of the extent to which forecasted impacts are likely to meet these.

Finally, from the standpoint of proponents, there are benefits to be gained from the use of EA. These depend largely on the extent to which the EA process is integrated with project and proposal design but can include:

- cost-effective improvements in the design and siting of a plant;
- savings in capital and operating costs if environmental problems have not been considered at the beginning and require rectification later;
- avoidance of risks, penalties and liabilities that come from overlooking important aspects of environmental performance; and
- promotion of design of environmentally appropriate technology and green business opportunities.

Box 3.6 A Statement of Benefits of EA

Based on decision and case analyses, a series of benefits from the application of EA are listed below:

- early withdrawal or preemption of unsound proposals
- green check or legitimization for well founded proposals
- last-recourse stop to proposals found to be environmentally unacceptable
- improvement tool for "mainstream" proposals, including
  - relocation of projects and activities to more suitable site
  - selection of best practicable environmental option (or equivalent concept)
  - redesign of projects to minimize, reduce or avoid environmental impacts
  - changes to or rescheduling of planned activities, e.g., to accommodate environmental and community concerns
  - mitigation of impacts by measures additional to those above, including rehabilitation, impact compensation
  - policy clarification and redefinition
  - institutional response and adjustments
  - organizational learning (EA has a vehicle for "education" or value change)
  - securing "equity" benefits for communities and groups affected by proposals
  - community "development" through participation.

3.3.3 Ingredients of Success

The keys to successful performance in EA will generally conform to the process and operational principles identified in the previous chapter. In Box 3.7, ten factors that contribute to EA effectiveness are identified on the basis of case studies reviewed and practitioners comments. A further analysis drawing on work by Scholten (1995) and Doyle and Sadler (1996) has organized these into or four major determinants. These are:

- timing or initiation of EA;
- scoping and preparation of terms of reference;
- the quality of the information and other products; and
- the responsiveness of proponents, decision makers and their senior advisors.

Timing or initiation of assessment. The principle of applying EA as early as possible in the decision-making cycle is widely accepted in principle, but requires qualification, in practice. The right "starting point" for EA will differ with the jurisdiction and the circumstances. World Bank (1995) experience, for example, indicates that an EA should be prepared as an integral part of project preparation, beginning in the early design phase to make the maximum contribution to environmental planning. However, this is much easier to accomplish with sectoral and regional EAs than with project-specific EAs. In practice, many project EAs are carried out relatively late in the overall decision-making process when many strategic alternatives have been already foreclosed.

Generally, experience in leading countries points to the importance of "just-in-time" initiation of the EA process -- which is to say sufficiently early to enable the proposal to be properly scoped for development of reasonable alternatives, consistent with the strategic decisions already taken. As Scholten (1995) notes with regard to Dutch EIA practice, starting the process too early can widen the scope unduly, resulting in a voluminous document containing information that is not relevant to the decision that will be made, and starting the process too late means that realistic and viable alternatives may have been discarded in a preceding stage.

Scoping and focusing the assessment. EA terms of reference on proposal-specific guidelines emerge as critical determinants of an effective process that adds value to decision-making. Based on and incorporating the results of a scoping process, this document specifies the approach that will be taken to assessment (within some jurisdictions, detailed work plans or schedules). It typically identifies the important issues and impacts to be addressed and the alternatives to be considered, relevant to the decision that must be made. This last element is of particular concern in producing a concise and useful EA. Experience in many countries indicates problems are encountered in: closure of the scoping "diamond" to focus on priority issues, impacts and alternatives, and directing the analysis toward the information required for decision making.

The identification, analysis, and comparison of alternatives to the proposal is the key to creative, proactive, decision-relevant assessment. Usually, two to four options, including the "no-action" alternative, are examined. Plan and programme-level EA is better placed than project EA to address major locational and technological options and to present these in a decision-making format that facilitates an appreciation of the trade-offs and assists selection of an appropriate course of action. Within a narrower band, however, project EA can and should compare locational and technical alternatives to establish the most environmentally-friendly or of best practicable environmental option. In all cases, however, the level of effort, as with the analysis of impacts, must be consistent with the potential environmental significance of the purpose.

Quality of information and products. The EIS or EA report is the focal document in providing information for decision making. As noted earlier, the technical quality of this product has become subject to increasing review using various criteria that establish the potential contribution to decision making. While still limited, these reviews generally indicate:

- an improvement in the quality of EISs as national experience builds;
- their increasing relevance for decision making (although not necessarily a one-to-one correspondence); and
- the particular value of executive, non-technical summaries for communicating vital information to decision makers and the public.

In the final analysis, the quality of the report is a reflection of the effectiveness of the whole process and is specifically determined by:

- the guidance provided terms of reference established by scoping;
- the adequacy of the methodology used to analyze impacts;
- the clarity of the linkage between impacts identified and the mitigation measures qualified; and
- the framing of alternatives in terms of environmentally favorable actions (though very few EAs place environmental impacts in a cost-benefit framework).

Responsiveness of decision makers and proponents. With very few exceptions, decision making is a separate activity in which the EA process is one of several information flows. Good quality products supplied in a consistent and timely fashion are clearly the best way of securing influence in decision making. Generally speaking, however, EA administrators and practitioners are under few illusions that the process is overly appreciated by decision makers, proponents, and officials in development agencies. More to the point, there are sufficient checks and balances in leading EA systems to ensure that the assessment findings are not easily set aside or ignored, especially with regard to larger, controversial proposals.

A well founded EA process, as noted earlier, will incorporate various institutional safeguards. From the perspective of decision makers, the following are perhaps the three most critical common denominators:

- *open procedures* -- public input and scrutiny confer political legitimacy and empowers assessment;
- *use of science* -- technical analysis and peer review are seen as giving assessment an important measure of objectivity and defensibility; and
- *coordinating mechanisms* -- the government-wide arrangements that are in place for responsible authorities to negotiate solutions to issues and concerns prior to formal approvals.

Box 3.7 Ingredients of Success:

The keys to successful performance in EA include:

- *initiation* -- start early; regard pre-planning as an investment in success
- *scoping* -- close the "diamond"; identify priority issues that will focus the EA and ensure the process is geared to the nature and significance of potential effects (not vice versa)
- *terms of reference* -- establish clear timelines to decision making, specify roles etc.
- *impact analysis* -- use appropriate practical methods consistent with the nature of the issue no point in using GIS if a checklist serves the purpose (or vice versa)
- *public consultation* -- ensure affected or interested parties have a say; master the techniques of information gathering to the scope of the issue(s) and to the needs/capacities of the parties[1]
- *best practicable science* -- take independent advice on application and more complex methods, and confidence levels in results[2]
- *mitigation* -- custom design measures to the problem; follow up on the success of non traditional or new innovative techniques
- *evaluation of significance* -- draw best-judgment conclusion about impact acceptability based on the likelihood, range and severity of effects (and their social and community consequences) recognize that evaluation of significance takes place throughout the process and comprises a narrowing cone of resolution on which closure is needed once residual (after mitigation) impacts are identified
- *EIS/EA report* -- write in plain English for decision makers and other users to identify: the main issues, predicted impacts and estimated consequences of a proposal and the alternatives considered; confidence limits in analysis where critical; areas of agreement and disagreement including views of affected and interested parties; and key trade-offs with balanced advice on disposition of and/or conditions of implementing a proposal (note: that not all jurisdictions make recommendations as part of EA)
- *review of EIA quality* -- undertake as required, whether a quick final check (e.g., for a small-scale assessment) or an independent, public or expert review (e.g., for major proposals)
- *follow-up* -- essential (but neglected) component; use four steps correlated to the potential significance and uncertainty of estimated effects:
  - inspection/surveillance to check terms and conditions are implemented
  - effects monitoring to determine if impacts are as predicted
  - impact management to address unanticipated problems
  - impact audit and process evaluation to learn from experience, disseminate information and stop "reinventing the EA wheel"

[1][Note: the tendency to hold meetings because that is what proponents/agencies have always done or are comfortable with appears to be the biggest single source of ineffective performance in this area].

[2][Note: methodological overkill may be a larger problem in EA than is conventionally realized with important repercussions on efficiency and effectiveness.]

3.3.4 Results and Costs of Environmental Assessment

The EA process does not end with approval. The test of effectiveness of EA-related measures lies in their implementation and the results achieved. Other actions and events filter this relationship of the information given, decisions made, the actions taken, and the outcomes on the ground. In addition, monitoring and follow-up information required for performance evaluation is critically deficient as noted earlier, and even with established progress there are well documented difficulties with establishing systematic linkages of predicted versus occurred impacts. These make comparison of results and costs speculative (see examples in Folios).

Results. A number of attempts have been made to examine experience with the implementation of projects and activities subject to full EA. These include the impact audits, post-project analyses, and evaluation studies reported earlier. Recently, the World Bank has undertaken a review of experience in applying full EA to 74 Category A projects. The main conclusions, which broadly correspond to those reported from other sources, are that (World Bank, 1995) projects subject to full EAs appear to perform better than others, and that it is reasonable to suggest that EA makes a positive contribution to overall project performance as well to a significant reduction of potential environmental problems.

In cases where impacts predictions have been audited, the following conclusions can be generalized:

- major or significant effects are usually correctly identified in the majority of cases, though accuracy of prediction varies substantially (where quantitative measures are available),
- minor or moderate (non-significant) effects are much more likely to be overlooked;
- generally speaking, first order effects (e.g., changes to air quality) are much easier to predict than second-order effects (e.g., on primary productivity and populations) and third order effects (e.g., changes in a wildlife behavior and community structure),
- cumulative effects can be predicted only in a general sense and the problems increase with scale; and
- where mitigations have been "monitored" or examined, most appear to generally work as intended.

Costs. Estimating the costs of compliance with the EA process has typically been a creative accounting exercise. The main costs involved data gathering, undertaking technical work and preparing documentation. It is hard to separate many of these costs from those incurred in planning and data gathering for other purposes (e.g., feasibility design). Few agencies keep any type of records or track costs. Generally, the accepted rule of thumb is that EA costs are 1% or less of what project costs (e.g., World Bank, 1995; US Council on Environmental Quality, 1995).

A recent study in British Columbia to identify likely cost of compliance with the province's *Environment Assessment Act,* represents one of the more detailed examination of this subject to date. Using data provided by companies that had undergone mine, energy and major project review systems in place in B.C., the study found that (Rescan, 1995):

- environmental review costs, as a percentage of capital costs, ranged from 0.2% to 7.8%, with an average of 1.4%;
- total incremental review costs ranged from $76,000 to $2.4 million with an average of $1.0 million; and
- new projects and those in remote areas had significantly higher review costs.

Industry and proponents also claim there are additional costs incurred as a result of delays and inefficiencies in the process. The B.C. study, not unexpectedly, confirmed that costs rose with duration of process. However, timelines and other controls can be used to manage the EA process to schedule. There is considerable room in a number of jurisdictions to improve process certainty and efficiency, though some aspects cannot be compromised, e.g., where an EA report is substandard and requires additional work. On a wider front, the comparison of sunk costs with environmental benefits delivered is a matter of judgment. Generally, information from the macro studies cited above and from the survey responses reported in the next chapter indicates that costs are seen as reasonable in the light of the benefits delivered.

3.4 Key Points-- Summing up this Chapter

Key perspectives on EA effectiveness. In considering the effectiveness of EA processes, key questions are:

- Were provisions and principles applied?
- What did EA contribute to decision making?
- Were the terms and conditions implemented?
- What were the benefits to the environment?

Basic Concepts and Criteria

Relevance for decision making, i.e., whether and how the process facilitates and results in informed choice, recognizing the distinction between:

- information provided by EA for decision making (is it timely, credible, focused on the issues?), and
- influence of EA on decision making (were the terms and conditions based on conclusions and recommendations provided?).

Enabling conditions of sound performance. The main components are:

- appropriate institutional framework with quality controls, e.g., clear requirements, procedural guidance, provisions for independent review; and
- adequate operational capability to implement "good practice" including: rigorous analysis; responsive consultation, and responsible administration.

Results in cost effective delivery of environmental benefits as indicated by:

- impacts are correctly predicted and mitigation measures are successful;
- environmental changes as a result of the proposal are within acceptable limits; and
- achieved at lowest possible or reasonable cost.

Added value of EA to decision making

Direct benefits include:
- withdrawal of environmentally unsound proposals;
- modification and change to proposals to improve their environmentally acceptability; and
- impact reduction, environmental protection and community safeguards.

Indirect benefits include:
- community development through public participation;
- policy redefinition and raising of environmental standards;
- stimulates research to fill gaps in basic knowledge; and
- facilitates the design of environmentally appropriate technology and generates green industry opportunities.

Four Ingredients of Success

Success Factors included:

- right timing in initiating EA so that the proposal is reviewed sufficiently early to:
  - include the impacts that matter; and
  - develop realistic and viable alternatives;

- clear proposal giving specific direction in terms of reference or guidelines, e.g., covering:
  - priority impacts and issues to be addressed;
  - study approach and schedule including timelines; and
  - providing opportunities for information and input to key stages of the decision-making process;

- quality information and usable products fostered by:
  - compliance with procedural requirements and guidance;
  - use of appropriate methodology and good practices; and
  - communicating the results to decision makers and the public in clear non-specialist coverage;

- receptivity of decision makers and proponents to use EA results -- which can be assisted by:
  - provision of relevant information in a timely fashion; and
  - establishing "safeguards" that build the requirement for "political accountability"; (e.g., involvement of the public; use of objective, scientific approach).

Folio 3.1:
Checklist for Review of EA Process Effectiveness

The checklist is broken down into four parts. Each one can be completed as a separate exercise or as part of a comprehensive process-wide or proposal-specific review. Some adaptation to circumstances will be needed. Not all questions may be relevant, and for in depth review, supplementary ones will certainly need to be added. Finally there are two levels of detail at which the evaluation may be undertaken:

- marking whether the item is present or not with comments as required; and
- grading the level of appropriateness of component or performance of our activity as per the rating scales used in each sector.

Step 1: Appropriateness of institutional controls

The following rating scale may be used to answer the following questions in detail:

A. excellent (comprehensive and sufficient)
B. good (minor gaps and inadequacies)
C. satisfactory (some gaps and inadequacies)
D. poor (significant gaps and inadequacies)
E. very poor (fundamental flaws and weaknesses)
F. no opinion (insufficient basis/experience on which to judge)

Yes/No/Comments

Is the EA process based on or did it include:

a) clear legal provisions?
b) explicit requirement to cover all environmentally significant proposals?
c) broad definition of environment/coverage of factors?
d) opportunities for public involvement?
   i. at specified stages only?
   ii. throughout the process?
e) procedures for independent, expert review of EAs?
   i. by inter-agency committee?
   ii. by spending commission or equivalent body?
   iii. by ad hoc panel, board or tribunal?
f) guidance on application of procedures?, including
   i. proposal-specific terms of reference?
   ii. agreed timelines for completion?
g) visible linkage to decision making (e.g., approval, permitting etc. based on submission of report)?
h) specification of terms and conditions for implementation?
   i. with provision for follow-up (e.g., monitoring)?
   ii. that are legally enforceable?

Step 2: Adequacy of operational performance for main stages and components of EA.

The following rating scale may be used to answer the following questions in detail:
A. excellent (thoroughly and competently performed)
B. good (minor omissions and deficiencies)
C. satisfactory (some omissions and deficiencies)
D. poor (significant omissions and deficiencies)
E. very poor (fundamental flaws and weaknesses)
F. no opinion (insufficient basis/experience on which to judge)

Main stages: Were the following activities completed fully and successfully?
a) screening -- proposal classified correctly as to level and requirement for assessment?
b) scoping -- process completed and resulted in initial closure?, i.e.,
   i. priority issues and relevant impacts identified?
   ii. key actors involved?
   iii. reasonable alternatives established?
   iv. terms of reference/study guidelines prepared?
c) impact analysis -- process completed in scope and depth necessary?, including
   i. affected environment (baseline) conditions described?
   ii. estimation and prediction of main impact categories?, including
      a) indirect and cumulative effects?
      b) other relevant factors?
   iii. suitable database and methodologies used?
d) mitigation -- necessary measures or environmental management plan identified?, including
   i. follow up and monitoring arrangements if strategies are untried or impacts uncertain?
   ii. specification of contingency plans or non-standardized operating responses?
e) significance -- residual effects evaluated as to potential severity?, including reference to
   i. their scope, duration and irreversibility?
   ii. relative importance to dependent communities or ecological functions?
   iii. possible compensation or offset mechanisms (also 2d)?
g) EIS/EA report -- information included is consistent with the process followed?, and is
   i. complete -- informed decision can be made?
   ii. suitable -- right type of information included?
   iii. understandable -- easily apprehended by decision maker?
   iv. reliable -- meets established professional and disciplinary standards?
   v. defensible -- risks and impact are qualified as to proposal uncertainties?
   vi. actionable -- provides clear basis for choice and condition setting?
h) review of quality -- undertaken to the degree and the level necessary?, including
   i. use of suitable methodology?
   ii. subject to public review and expert comment?

Key components: Were the following components undertaken fully and successfully?
(Note: this analysis may be completed for the process as a whole or included as part of a step-by-step examination of 2a) - g) above.)
i) technical studies --
   i. rigorously conducted, consistent with the nature and complexity of the issues?
      at all stages?
      at some stages?
   ii. work conformed to prevailing standards of good science and EA practice?
      at all stages?
      at some stages?
   iii. resulted in the preparation of high calibre, defensible basis for assessment?
      at all stages?
      at some stages?

j) public involvement --
   i) opportunities were responsive to the people involved having regard to
      - likely extent of environmental impact and social dislocation?
      - degree of public concern/conflict that was evident?
      - the traditions of the affected population?
   ii. approaches and techniques used were relevant to issues and constituencies involved?
      in all cases?
      in some cases?
   iii. resulted in views and concerns of affected and interested parties being clearly
      identified and incorporated?
      into all key documentation?
      into final EIS report only?

k) process administration --
   i. applied in accordance with established principles and basis provisions?
      at all stages?
      at some stages?
   ii. process managed efficiently, i.e., without undue delay or cost to proponents and others?
      with
      timelines and schedules negotiated upfront?
      completion in accordance with these?
   iii. oversight of activities was consistent and impartial? e.g., recognizing
      need for fairness to minority and other groups?

Step 3: Relevance of Decision Making
The following rating scale may be used to answer the following questions in detail:

1) very influential
2) moderately influential
3) marginally influential
4) not influential

Did the EA process evidentially* result in the following:
(* as documented by records of decision or as reported by a cross-section of participants).

a) at the pre-approval stage -- proposal was modified or changed for the better
   environmentally on the basis of EA?, e.g., by

   i. alteration of the initial concept?
   ii. selection of alternative approach?
      technological?
      locational?
      redesign?

   iii. other pre-submission decisions by the proponent?, e.g., to
      provide offsets, such as setting aside natural areas?
      negotiate impact compensation package with affected communities?
      other?

b) at the formal approval stage -- information from the EA process provided an end basis for approval(s) and condition setting?, e.g., as

   i. documented in the EIS (see 2f)?
   ii. as supported by the adequacy of
      technical studies (see 2h)?
      public involvement (see 2i)?
      process administration (see 2j)?

c) influence on decision-making, specifically where the conclusions/advice and recommendations in the EIS/EA report were.

   i. fully or substantially followed?
   ii. partially or moderately followed?
   iii. ignored or marginally followed?

d) if the EIS/EA report was partially or marginally influential on approval and condition setting, what were the reasons?, e.g.

   i. as described by the analysis of input to decision making?
   ii. due to intrusion of other factors and circumstances?, please specify:

Note: what is the evidence for the interpretation?
- comparison of EIS report content with record of decision?
- interviews with participants?
- other?
-

e) identification of follow up requirements?, including

   i. supervision or surveillance of compliance?
   ii. impact monitoring?
   iii. environmental management plan?
   iv. environmental or impact audit?
   v. post-project analysis or other research or studies?

f) terms and conditions implemented?

   i. fully?
   ii. partly?
   iii. inadequately or not at all?

g) if terms and conditions were not fully implemented, what were the reasons?, e.g.

   i. unforeseen impacts and/or ineffectiveness of mitigation measures necessitated changes?
   ii. other events and circumstances intervened?

Step 4: Overall Results of Effectiveness

Based on evidence from monitoring, auditing and other sources, what were the overall results of the EA process?

a) impacts were as predicted or forecast*?

   i. in most cases >66% with minor inaccuracies?
   ii. in fewer cases <33% with major inaccuracies?

b) mitigation measures or management plans worked as intended*?

   i. in most cases >66% with no minor problem?
   ii. in fewer cases <33% with major problems?

c) environmental objectives, criteria or standards met by the project/plan as implemented*?

   i. as confirmed by compliance or effects monitoring?
   ii. as evidenced by other sources of information?

d) impacts were avoided, mitigated or reasonably compensated*?

   i. in most cases >66% with no unacceptable loss or damages?
   ii. in fewer cases <33% with unacceptable loss or damages?

e) other environmental and community benefits were realized as described?

   i. in most cases >66% with other minor difficulties encountered?
   ii. in fewer cases <33% with major difficulties examined?

f) the EA process was within the usual 1% cost range in relation to the overall capital investment in proposal development?

   i. yes?
   ii. no (specify why)?

g) on balance, was the EA process was effective judged against the basic yardsticks?

   i. substantive -- terms of reference and basic objectives were achieved?
      - as documented by inputs to decision-making?
      - as demonstrated by environmental and community benefits (impact avoidance)?

   ii. procedural -- the process conformed to established or accepted principles, provisions and procedures?, i.e.,
      - as shown by appropriate institutional controls?
      - as evidenced by successful completion of main stages and components?

   iii. transactive -- results and environmental gains were achieved cost-effectively?, e.g.
      - at least cost as shown by appropriate methodology?
      - at reasonable cost as estimated by informed judgment?

*Note: for many judgments in this section, reviewers will need to customize "band widths" (e.g., 2a, b, d, e) and incorporate EA audit frameworks and protocols.

Sources: Sadler, 1987; Canadian Environmental Assessment Research Council, 1988; Davies and Sadler, 1990; Sadler, 1990; Sippe, 1994a; Colley and Raymond, 1994; Hilden and Laitin, 1995; Wood, 1995.

Folio 3.2:
Use of EISs in Decision-Making and Effectiveness of EIA in the Netherlands

Background: In the Netherlands, the EIA regulation was established under the 1987 *Environmental Management Act*. A major review of the first three years of EIA implementation found a "reasonably functioning instrument". Subsequently, the Ministry of the Environment commissioned two pilot studies to link the aims of the EIA regulation with "what actually happens". In study one; fifty EIS were evaluated as to their quality; and ten of these were examined to determine their use in decision making and to gain a better understanding of the effectiveness of the EIA process. The latter study is summarized in this note.

Objectives and approach: The instrumental effects of EIA on decision making were measured in relation to two key questions:

- Does the process improve consideration of the "environment interest" in decision making?
- Does decision making improve as a result of applying EIA?

The Dutch evaluation team noted effectiveness is a layered concept with four key parameters:

- visible effectiveness -- reflected in project documentation and related sources;
- apparent effectiveness -- identified by what is being done with the information in the EIS;
- perceived effectiveness -- as described by the main actions in the process independent; evaluation e.g., initiator, complement authority; and
- explained effectiveness -- comprising reasoned conclusions.

Four of the EIAs involved the granting of permits; six were linked to plans.

Overview and comparisons of results: The ten EIAs were initially graded with respect to quality of the EIS and to overall effectiveness or contribution to decision making. Key findings:

- *EIA-permit cases*: two EISs were graded as sufficient, and two were graded as insufficient. The last two cases were judged ineffective with no visible, and apparent or perceived contribution to decision-making; the first two cases were considered to be positive on all three counts.
- *EIA-plan cases:* four EISs were graded as sufficient and two were graded as insufficient. In the first four cases, three were judged as making a visible, apparent and perceived contribution to decision making. The latter two cases were judged as having no visible or apparent effectiveness, but were perceived as making positive, indirect contributions to decision making and/or having procedural advantages.

Conclusions: What stands out, is the degree of "internal coherence" in positive evaluations of effectiveness across the reviewed cases. The successful cases were judged as effective in terms of visible, apparent and perceived contribution to decision making. Secondly, certain

cases evaluated as being not visibly or apparently effective were perceived as having positive indirect value (e.g., spurring wider policy debate or stricter environmental standards).

The main conclusions of the review are:

- EIA is more effective when the EIS is of sufficient quality;
- EIA in the Netherlands appears to be more effective where the competent authority is also the initiator; and
- EIA procedures have both an anticipatory influence on planning (improved preparation and objectivity to meet the external test) and an "echo" effect (redefining activities and policies) on the basis of the experience.

Sources: van de Gronden, *et al*, 1994 a,b.

Folio 3.3:
The Norwegian EIA System -- Evaluation of Effectiveness

Background: An evaluation of the Norwegian EIA system, comprising of the process followed and case experience to date, was undertaken in reference to a checklist of effectiveness questions. The analysis is based on information on all of the EIAs carried out in Norway during the initial four year period of operation.

The review was organized to address seven issues:

- *At what stage in the planning process are environmental considerations introduced?*

Formal public notice triggers consideration under the Norwegian system for projects and activities that have implications for the environment. In some cases, planning is well advanced at the time of notification, with proponents "locked into" a particular alternative. Certain competent authorities also work with proponents to circumvent a full EIA -- which can be avoided if a notification is considered to provide "sufficient and required information". In effect, some notifications become "mini-EISs" to try and gain early acceptance.

- *What are the objectives of the assessment procedure and how is it organized?*

The decision on whether or not to require full scale EIA is taken by the competent authority when "clearing" the notification. For the period 1990 to 1994, 107 projects required notification, 32 were pending at the time of writing, 49 were designated as "notification approved" and 26 went to full EIA. The procedure follows national EIA regulations and guidelines, and is specified further in an assessment programme. This is a critical document which sets the standard for quality of an EIA.

- *Have environmental concerns and EA contributed to change in the planning, decision making and authorization processes?*

There appears to be an apparent shift toward an "up front" approach, with greater planning and assessment effort at an earlier stage of the process than before. Delays are characteristic in certain sectors, notably roads and railways, because of their scope and planning complexity. It is difficult to document whether new decision issues are being raised through EIA, although the process catalyzed a more interdisciplinary, and, problem-relevant approach. Public participation, however, varies considerably and is not as strong as initially expected.

- *What is the relationship of the assessment procedures and project planning?*

In general, the no-action alternative is poorly addressed. Also, many of the alternatives identified are "tactical" rather than real. For example, certain industrial projects have presented options that have very negative employment assumptions but are without adequate supporting documentation.

- *What other influences do EIAs have?*

The EIA process appears to facilitate a degree of compromise and consensus on objectives. There are, however, important exceptions, notably for contentious projects, e.g., site selection for radioactive waste facility.

- *Do EISs reflect issues developed during assessment?*

In general, the answer to this question is yes. Still of concern however, is the extent to which issues, alternatives and environmental considerations are given balanced treatment in EISs.

- *What problems have been encountered in the implementation of the EIA process?*

Scoping is limited and not particularly effective. Few problems are found with the overall multidisciplinary approach taken to EIA. Where concerns occur they relate to the emphasis given to issues, and to the outcome of presentation. For example, methods for aggregation of date are insufficient.

Source: Tesli, 1995.

Folio 3.4:
Efficiency Audit of Commonwealth Environmental Impact Assessment Process, Australia

Background: In 1993, the Australian National Audit Office (ANAO) reviewed the efficiency and effectiveness of the Commonwealth EIA process. Carried out by the Auditor-General, the report was transmitted directly to the Australian Parliament. Under Commonwealth systems of government, auditors-general have strong powers of independent scrutiny. The ANAO audit is of interest in this regard, and because of the formal, reporting methodology employed.

The audit in summary: The audit recorded a number of major concerns about the EIA process, notably:

- its complexity and overlap with other state and territorial regimes;
- uncertainty about referral criteria;
- length and complexity of the EIA process, and related concerns about time constraints and delays to proposals;
- problems with scoping, including lack of a systematic attempt to build corporate knowledge; and
- lack of mechanisms for monitoring and quality assurance.

Agency response: The Commonwealth Environmental Protection Agency (CEPA) had the opportunity to respond, and its comments were incorporated directly into the ANAO report. The CEPA noted that the process is frequently brief and simple for over 94% of referrals, that many delays are the result of proponent timing and not EIA *per se;* and that the status of any proposal is easily checked.

Conclusions and recommendations: The ANAO considered there were three likely consequences of the problems:

- there is an incentive to manipulate the EIA process and possibly, to circumvent its application;
- there may be a disincentive to invest in major projects because of the apprehension about unnecessary costs, time delays and uncertainties; and
- the lack of monitoring could result in damage to the environment going unnoticed.

Recommendations directed at action agencies and the CEPA included:

- streamlining procedures for processing applications and reducing unnecessary referrals;
- improving coordination of the process and formalizing roles and responsibilities;
- establishing management process information systems;
- conducting quality assurance checks or EIA considerations; and
- including monitoring and reporting requirements in licences issued consequent to EIA.

Source: Australian National Audit Office, 1993.

Folio 3.5:
Review of Quality of Environmental Statements for Planning Projects in the United Kingdom.

Background: In the UK, the European Commission's EIA Directive 85/337/EEC has been implemented through a series of regulations. Approximately 75% of the environmental statements (ES) prepared are for projects requiring planning consent from a local authority. For this class of projects, the UK Department of the Environment commissioned a review of changes in ES quality over the periods 1988/1990 to 1992/1994. The study approach and results are summarized in this note.

Objectives and approach: The aim of the review was to establish what changes had occurred in the quality of ESs since an earlier study (UK Department of the Environment [1991a]) and to explain the reason for such changes. The review was divided into 2 components. A *macro-study* included the review of 25 pairs of pre-1991 and post-1991 projects against regulatory requirements criteria and three review frameworks. A *micro-study* for a sub-set of ten matched pairs of ESs involved the review of case files and questionnaire interviews to gain the perspective of key participants.

Changes in ES quality. An early study of EA Quality in the UK covered the first 18 months of the operation of the formal EA system (1988-1989). This evaluation rated the majority of ESs reviewed as being of an inadequate quality.

The *macro-study* revealed an improvement in ES quality over the short time period established for the review, irrespective of criteria applied. Based on regulatory requirements, 44% of post-1991 ESs fulfilled *all* criteria, compared to 36% of pre-1991 ESs. Using the comprehensive framework, the percentage of satisfactory ESs increased from 36% to 60%. However, this also means some 40% were graded unsatisfactory and in several cases were rated poor.

In the *micro-study,* participants held a common view that pre-application activities had an important bearing on ES quality and the time taken to process applications. Early consultation, negotiation, and participation in scoping the ES were considered to have an important bearing on good practice.

Determining factors of ES-quality changes: Quality products are clearly associated with the more experienced developers, consultants, consultees and local planning authorities. As experience builds, with more ESs to provide benchmarks, the expectations of all parties increase. This acts as a catalyst for improved quality. Improvements in EA guidance and training are also thought to be important, as is the accreditation system for consultants established by the Institute for Environmental Assessment.

Conclusions: The study revealed definite improvements in the quality of ESs, but also indicated that a substantial proportion of ES are still unsatisfactory. Features of good quality ESs include: clear structure, coverage of complex issues and alternatives, commitment to monitoring, and good consultation. Features of poor quality ESs included: low objectivity and complex technical content.

Source: Glasson, *et al*, 1995.

Folio 3.6:
Follow-Up Report on Rabbit Lake Uranium Mining Environmental Assessment Panel Review, Canada

Background: In 1991, a federal environmental assessment (EA) panel was appointed to examine the environmental, health, safety and socio-economic impacts of a proposed uranium mine at Rabbit Lake, in northern Saskatchewan. The four member panel completed the review two years later. Key steps in the process included: submission of a draft environmental impact statement (EIS) by the proponent; public review and local community meetings; request by the panel for additional information; and region-wide public hearings on the refilled EIS. The review was a particularly challenging. A candid and valuable follow-Up report was prepared by the Panel Secretariat on the lessons learned with a view to improving future effectiveness of the review process.

Highlights of the follow-up report:

- *Project referral.* The referral letter made no reference to the nature or extent of public concern about the proposal. The Rabbit Lake proposal (already approved by the province) was referred to a federal panel at the same time as five other uranium mines in Saskatchewan were referred to a joint federal-provincial panel. Despite efforts to harmonize the review processes, only a consolidated approach could have eliminated confusion, secured cost savings, and provided a comprehensive focus and set of recommendations on the issue.

- *Panel mandate.* Specifically excluded from review were alternative means of generating electricity and government policy related to uranium mining and nuclear end uses. However, views on these and other broad issues were expressed throughout public hearings, creating much frustration. Questions on panel mandate are not unique to this review or to the issue of uranium mining. In all cases, a clear statement of rationale is the best way to proceed. The proposal came under the licensing process of the Atomic Energy Control Board, which chose, on completion of the review, to interpret the panel's report as advisory.

- *Scoping/guidelines for EIS.* Because the proponent had submitted a prior EIS to the Saskatchewan Government and the licensing board, the panel did not conduct formal scoping sessions nor prepare guidelines for the EIS, although community meetings served to identify locally important issues. Without scoping and EIS guidelines, the proponent tends to drive the review by identifying issues that it feels are important. In effect, the panel lacks a framework for review and a standard against which to evaluate the EIS.

- *EIS review.* The EIS was a difficult document to understand because it was an updated version of an earlier EIS and contained a number of inconsistencies. As a result the panel issued a substantive request for additional information. The proponent took over four months to respond, producing an additional two volumes of material. Following review of this material, the panel asked for six additional issues to be more fully addressed. This

resulted in submission of a further volume prior to the hearings. During public hearings, the panel put nine questions to the proponent in writing which were answered in the latter stages. The net result was a considerable amount of documentation which was not cross referenced, contradictory at times, and which lead to confusion among a number of review participants.

- *Public participation.* More than 130 separate written and/or oral submissions were received. Despite a participant funding programme attendance at many of the hearing sessions was low, especially at the community closest to the mine. In part, the parallel review process helps explain low, representation by the potentially affected public. However, it is also noted that the Canadian Environmental Assessment Agency must continue to explore mechanisms that will improve aboriginal participation in reviews. The public hearings were also subject to two protests, including demonstrations outside the hearing location.

Challenges:

There were a number of challenges during this review, including:

- a parallel review process into other uranium mining proposals;
- the pre-emption of the scoping and guidelines stage by a pre-existing EIS;
- a relatively low level of community participation; and
- continued attempts by some participants to open the review mandate to wider issues.

Source: Mathers, *et al*, 1994.

Folio 3.7:
Verification of Impact Predictions in Environmental Assessments of Oklahoma Surface Coal Mines, USA.

Background: The ideal procedure of using "before and after" data to compare actual versus as predicted impacts in order to reach a statistically valid conclusion, is not always practical An alternative is the so-called "impact-backward" audit, which applies simple techniques to check predictions made in EISs and similar types of documentation. This approach has been used to improve NEPA implementation by Region 6 of the US Environmental Protection Agency.

Approach: "Impact-backwards" protocols for NEPA audit and verification purposes were developed by Lee Wilson and Associates (1992). The approach was designed to formalize and improve existing *ad hoc* monitoring of EISs, and involves: selection of test projects; use of several different techniques to identify actual impacts; an iterative process of comparison to EIS on a priority basis; and qualitative evaluation to identify significant under-predictions and measures to avoid repeating similar errors in the future. An essential feature of the approach is the use of simple methods for impact identification and verification by extensive consultation.

Case application: The methodology was applied to review coal mines in eastern Oklahoma both to test the approach and to improve NEPA decisions in support of EPA regulatory permitting. The test mine site was issued a permit following an EA (preliminary assessment under NEPA) and a "Finding of No Significant Impact (FONSI)" Representative impacts were identified which could be expected to occur from coal mine projects. EPA predictions for a candidate project were checked against actual impacts (as ground-truthed by expert network, observation and simple measurement of environmental indicators). The audit found that impacts were under-predicted. Many off-site effects of active operators (e.g., vibration from blasting, dust from coal transportation) were not forecast. Site reclamation, while good, did not meet the level of productivity or habitat restoration expected by the EPA. Other issues that could not be identified in site-specific NEPA documents but which need future attention by the EPA include cumulative habitat impacts and risks of reclamation failure.

Implications for NEPA: Preliminary EA, using a simple checklist approach, is recognized as an effective valid means of implementing NEPA commitments. However, this needs to be refocused for multiple projects in a region by:

- a programmatic EIS to provide a performance framework for project-specific analysis and to address cumulative effects; and
- extended scoping for projects that require greater level of EA attention.
- five-year "impact-backward" audits of specified projects to provide quality assurance;

Lessons: The "impacts-backward" approach is a practical technique for spot-audit and verification for EA quality control, but is labour-intensive and needs to be used on a priority basis. This level of commitment, in specified cases, is also an argument for building a "forward" impact monitoring programme with provision for spot-audits.

Source: Lee Wilson and Associates, 1993.

Folio 3.8:
Decision Making in EIA in Hong Kong

Background: Under the existing EIA system in Hong Kong, there are several key checks and balances in the decision making process. The Hong Kong Government is executive led. The Hong Kong Governor is advised by an Executive Council (EXCO) which performs a similar role to a cabinet in other administrations. The Legislative Council (LEGCO) is responsible for enactment of legislation and also for approving funding for government works projects and spending in general. Government business is overseen by several policy branches headed by a permanent Secretary operating very much like Ministries elsewhere.

Process Controls:

- *Decision on the adequacy and acceptability of the findings of EIA.* The Director of Environmental Protection (DEP) convenes a Study Management Group consisting of all relevant departments and the proponent to oversee the technical adequacy and acceptability of the findings, and forms a view as to whether to endorse the EIA study and accept the EIA report.

- *Referral to the Policy Secretary and the conflict resolution process.* This is an important component of the whole EIA system. Under the current system, the DEP refers the case to the Secretary or environment minister equivalent to resolve the matter when:
  - the EIA report shows that the project cannot be implemented without serious environmental impacts, or unless mitigation measures are taken at a cost unacceptable to the proponent;
  - if there is disagreement between the proponents and DEP on the findings and recommendations of the EIA study, the implementation of mitigation measures or the scope and funding requirements of the environmental monitoring and audit programme.

In both instances, the Secretary decides, in consultation with other policy secretaries, whether the project should proceed. If full resolution cannot be achieved the unresolved issues are referred to the Chief Secretary for determination.

- *External scrutiny by an appointed Advisory Council on the Environment.* On major EIA studies, especially of controversial cases, the Government will seek the views of the Advisory Council before making irrevocable decisions. The Council will advise the Government on whether the environmental implications of the project are acceptable and recommend the measures necessary for satisfactory implementation of projects.

- *Checks and balances.* When a project or policy proposal is submitted to EXCO or LEGCO for approval, the findings of the EIA, the views of the Advisory Council on the Environment and other consultative bodies, and the outcome of the conflict resolution will need to be presented to EXCO to make the final decision, taking into account other relevant factors.

Results:

- All these checks help to ensure accountability and transparency of the EIA process.
- The EIA decision making process together with the associated conflict resolution mechanism has resulted in a number of major projects significantly amended and re-designed to achieve better environmental performance.
- It has also lead to greater awareness of the importance of EIA at the highest level of the Government.

Source: Au, Hong Kong Environmental Protection Department, 1996.

CHAPTER 4:
EA EFFECTIVENESS SURVEYS

This chapter provides an overview of the results of surveys undertaken by the effectiveness study of the views of IAIA members, of national and international agency experience with EA, and of corporate use of assessment tools.

What does the effectiveness of EA look like from the standpoint of practitioners and administrators? A key part of the effectiveness study was to canvass their views on recent progress, current issues, and future directions for the field. This component was undertaken primarily through a questionnaire survey of IAIA members, with additional coverage obtained via other national and regional networks. For the first time, the status of EA practice can be gauged against a broad sampling of professional opinion. The aim of this exercise was to establish a benchmark or reference point against which to relate other judgments and findings, and to provide a basis for comparing the results of future surveys by IAIA and other interested organizations.

The IAIA survey was supplemented by other surveys of the status and effectiveness of EA. These included preparation of country status reports by responsible authorities on the way EA operates in those countries, and on the key trends and issues associated with administration and conduct of the process. A questionnaire survey was sent to countries and international organizations attending the 1994 International Summit on EA. This survey was complemented by a similar poll of multinational companies designed to find out how EA is applied at the corporate level.

4.1 IAIA Survey

This section provides an overview of responses to the questionnaire. It concentrates on key questions regarding the status and effectiveness of EA and omits much of the background detail (e.g., regarding respondents' areas of specialization, interest and type of assessment activities undertaken). A full report is published separately as a joint initiative of IAIA and the Battelle Research Centre, Seattle. The questionnaire was also distributed in Francophone countries by the French Ministry of the Environment and in South Africa by the national IAIA Chapter. In the first case, the results are published separately and, in the second case, the results were directly reported to the IAIA 1995 Annual Conference held in Durban, South Africa.

4.1.1 Survey Design and Administration

The questionnaire was designed as a joint initiative of IAIA, the Battelle Research Centre, and the UK Institute of Environmental Assessment. IAIA members were the main reference group. A first mail out was sent with the October 1994 Newsletter (Vol.6, No.2). Follow-up notices were included in subsequent newsletters. The questionnaire was also distributed through EA networks in the European Community, the UK, the Netherlands, Australia, and New Zealand

(see Box 4.1). (These additional inputs were sought in light of the strong North American base of IAIA membership).

A total of 324 responses were received over approximately a one-year period. The breakdown between the returns from IAIA and all other surveys was approximately 50/50. IAIA members mailed back 170 completed questionnaires, a response rate of approximately 15%. This is considered low given the special interest of members in the subject. However, it should be noted the questionnaire was long and detailed and in pre-tests the average time taken to complete it was over 40 minutes.

Seen in this context, the survey results are indicative of the views of sizable pool of EA practitioners, researchers, and other specialists. These are reflective largely of experience in areas where EA is furthest advanced -- North America, Western Europe, and Australia. Resources and experience were insufficient to attempt additional coverage of developing regions, where views might be expected to be different from those in industrial countries. This is an area that warrants additional attention, and information is expected to be made available through UNEP.

Box 4.1 IAIA Questionnaire Distribution

- IAIA members -- IAIA Executive Office
- European Trainers Network -- the EIA Centre, University of Manchester
- UK local authorities and consultancies -- Institute for Environmental Assessment
- Dutch practitioners -- KerMERken (EIA Magazine)
- Portuguese specialists -- (CEPGA)
- New Zealand planners and assessors, *Journal of Town Planning*
- French EIA experts -- Association Francaise des Ingenieurs Ecologues
- Australian state-level practitioners -- Environment Protection Agency

4.1.2 Adequacy of Institutional Frameworks

The institutional arrangements that are in force for EA are a basic determinant of effectiveness. In Table 4.1, the overall adequacy of current frameworks are rated. A five-point scale, from excellent to very poor, is used to grade fourteen key dimensions that are thought to contribute to good practice. Each respondent was asked to review these arrangements with reference to the country or jurisdiction within which they worked or were most familiar. Only aggregate perceived strengths and weaknesses of EA institutions are examined here.

Key aspects of institutional adequacy shown in Table 4.1 include:

- EA is founded on a satisfactory or better basis of law and policy, according to three-quarters of the respondents;
- the scope of application, requirements for compliance, procedures for conducting assessment, and provision for public scrutiny and participation are also considered to be reasonably sound;

- technical guidance is less favorably judged -- 50% of respondents believe it to be poor or very poor;
- also rated as poor or very poor by one-half or more of the respondents were requirements for undertaking monitoring, assessing cumulative effects and addressing sustainability issues.

Table 4.1: Adequacy of Institutional Frameworks

Q: How would you rate the adequacy of the institutional arrangements for the conduct of EA in your country/jurisdiction?

A. excellent (comprehensive and sufficient)
B. good (minor gaps and inadequacies)
C. satisfactory (some gaps and inadequacies)
D. poor (significant gaps and inadequacies)
E. very poor (fundamental flaws and weaknesses)
F. no opinion (insufficient basis/experience on which to judge)

	A	B	C	D	E	F
• Legal/policy basis	10%	37%	28%	15%	7%	3%
• Scope of application to development activities	7%	33%	33%	18%	4%	4%
• Requirements for compliance	4%	25%	35%	22%	7%	7%
• Procedures established for conduct of assessment	4%	24%	34%	23%	11%	3%
• Technical guidelines, (e.g., for determining significance)	3%	12%	31%	35%	15%	5%
• Provision for public scrutiny and participation	15%	27%	24%	18%	14%	2%
• Consistent impartial administration	5%	19%	31%	29%	4%	7%
• Links to decision making	9%	15%	37%	25%	10%	3%
• Enforceable terms and conditions	6%	19%	28%	25%	11%	11%
• Requirements to:						
• assess cumulative effects	6%	15%	21%	33%	21%	4%
• address sustainability issues	6%	11%	18%	37%	22%	3%
• consider socio-economic factors	5%	21%	34%	26%	10%	5%
• undertake monitoring	5%	15%	26%	32%	17%	5%

4.1.3 Scientific and Methodological Basis of Assessment

Five-Year Trend

The scientific and methodological basis is a key determinant of the technical quality of EA. In Table 4.2, eight major elements that collectively establish and shape impact analysis are rated as to their adequacy. A four-part rating scheme is used to identify the extent to which these elements have been strengthened during the last five years. The concern is to outline the overall extent of technical improvements and identify the contributing factors. Using this reference point, other perspectives on scientific and methodological aspects of EA effectiveness can be readily understood.

With respect to five-year trends, highlights in Table 4.2 include:

- except for supporting research, the majority of respondents considered that the main elements of the scientific and methodological basis of assessment have been strengthened;
- information systems and professional/technical competencies are the two areas that received strongest ratings as having been significantly or moderately strengthened; and
- supporting research was judged as having undergone little or no change by 46% of respondents, and 8% believed it to have been weakened.

Table 4.2 Adequacy of Scientific and Methodological Basis of Assessment

Q To what extent have the following elements of the scientific and empirical basis for assessment been strengthened during the last five years?

	Significantly weakened	Moderately Strengthened	Little/No Change	Have been Strengthened
• State of relevant science(s)	11%	50%	34%	1%
• Analytical methods, techniques	13%	50%	34%	0%
• Data sources	14%	49%	39%	4%
• Information systems	23%	51%	23%	1%
• Integrated multi-disciplinary approach	14%	48%	33%	3%
• Supporting research	5%	38%	46%	8%
• Training and networking opportunities	19%	45%	30%	3%
• Professional/technical competencies	12%	58%	25%	2%

State of the Science

In Table 4.3, the relevant science that underpins assessment is rated with respect to the limitation placed on five key areas of practice. A three-part rating scale is used, from "very limiting" to "not limiting". Key points include:

- mitigation and monitoring are the two areas where the underlying science is seen as least technically limiting;
- the underlying science is judged to be very limiting in terms of identifying cumulative effects (by 53% of respondents) and monitoring these changes on an ecosystem basis (by 55% of respondents); and
- one-third of respondents consider the state of the science is very limiting, and 53% believe it is somewhat limiting on their ability to make accurate predictions.

In addition, respondents were asked to estimate the extent to which "state of the art" science is applied in EA practice. About 32% consider this happens always or frequently, 22% consider state of the art science is used about half of the time, and 42% consider it is only sometimes or rarely applied.

Table 4.3: State of the Science

Q To what extent does the state of the relevant science limit the ability of practitioners to do the following?

	Very Limiting	Somewhat Limiting	Not Limiting
• Makes accurate predictions / forecasts	24%	53%	9%
• Custom designs successful mitigation measures	12%	58%	24%
• Establishes monitoring schemes that are able to detect significant development-induced effects	19%	48%	26%
• Identifies the cumulative effects of development proposals	53%	33%	9%
• Monitors cumulative changes on an ecosystem or regional basis	55%	32%	7%

Enabling "Best Practice"

In Table 4.4, views on the limitations on "best practice" imposed by eight components of the EA process are illustrated. The responses help to indicate the factors that support good practice and those that appear to require further attention. Of particular interest are the following:

- consistent with previous answers, the scientific and methodological basis of assessment imposes limitations on "best practice" in the view of most respondents;

- however, over 25% of respondents consider this is only somewhat limiting or not limiting for five "technical" components listed (i.e., scientific competencies, information systems, data sources, methods and techniques and integrated approaches); and
- by contrast, budget restrictions (61%) and time deadlines (46%) are considered very limiting on "best practice".

Table 4.4: Enabling "Best Practice"

Q How important are the following factors in preventing or limiting the application of "best practice", i.e., recognizing the limitations imposed by the state of the relevant science(s)?

	Not Limiting	Somewhat Limiting	Very Limiting
• Integrated approach	36%	42%	17%
• Methods and techniques	25%	56%	14%
• Data/information sources	19%	54%	23%
• Information systems	27%	53%	15%
• Scientific/technical competencies	23%	57%	14%
• Institutional norms and standards	15%	52%	28%
• Time deadlines	16%	35%	46%
• Budget restrictions	7%	28%	61%

4.1.4 The Conduct of Assessment

Performance of Key Activities

Table 4.5 summarizes respondents' views on how well key assessment activities are performed. A five-part rating scale is used to evaluate performance for twelve key stages of the EA process plus environmental auditing. This analysis is instructive in providing a comparative, step by step view of the strengths and weaknesses of assessment. It shows that:

- the EA process up to decision making is considered to be performed satisfactorily or better by the large majority of respondents;
- variations in observed accomplishment within the steps in this phase of the process are relatively minor, and overall no activity stands out as being particularly well or particularly poorly performed;
- the greatest reservation appears to be about public participation, with one-third of respondents rating it as poorly or very poorly performed;
- in the post-decision phase, EA activities are rated as falling well short of sound practice;
- monitoring is considered to be poorly or very poorly performed by 56% of respondents, and similar low-end ratings are given to surveillance of terms and conditions (50%), impact management (44%), and environmental auditing (47%);

- all of these activities, as well, have relatively high "no opinion" ratings (i.e., insufficient basis for judgment), which reaches 30% of respondents in the case of environmental auditing; and
- this combination makes for low ratings given to the performance of post-decision EA activities.

Table 4.5: Performance of Key Activities

Q: How well are the assessment activities listed below usually performed? Rated according to the following scale of sound practice (i.e., recognizing constraints imposed by the state of the relevant science(s)).

A. excellent (thoroughly and competently performed)
B. good (minor omissions and deficiencies)
C. satisfactory (some omissions and deficiencies)
D. poor (significant omissions and deficiencies)
E. very poor (fundamental flaws and weaknesses)
F. no opinion (insufficient basis/experience on which to judge)

	A	B	C	D	E	F
• Screening	4%	28%	27%	18%	6%	8%
• Baseline study	4%	23%	39%	21%	6%	8%
• Scoping	6%	27%	28%	24%	7%	7%
• Impact prediction	2%	23%	42%	22%	4%	6%
• Impact evaluation	2%	21%	42%	24%	6%	6%
• Mitigation	4%	22%	39%	21%	6%	8%
• Public participation	9%	24%	26%	21%	13%	6%
• EIS/report preparation	4%	32%	38%	15%	4%	7%
• EIS/report review	5%	25%	32%	23%	7%	7%
• Monitoring	2%	8%	21%	37%	19%	11%
• Surveillance of terms and conditions of approval	1%	10%	25%	31%	19%	14%
• Impact management	1%	9%	28%	30%	14%	18%
• Environmental auditing	2%	10%	18%	27%	20%	30%

Examination of Issues and Impacts

In Table 4.6, the focus is on the effective examination of problem areas encountered in assessment. A five-part rating scale was used by respondents to grade performance with respect to basic challenges (problem definition, objective setting and establishing alternatives), types of impacts (cumulative, socio-economic and transboundary effects), and consideration of policies, plans and programmes. The responses point to important differences in the capabilities of EAs as a problem-solving instrument:

- a majority of respondents believes that the process works satisfactorily or better with respect to problem definition and setting terms of reference;

- by contrast, almost 50% of respondents believe that the review of alternatives in EA is performed poorly or very poorly;
- similar unsatisfactory grades are given to examination of cumulative effects (by 66% of respondents), transboundary effects (52%), policies, plans and programmes (50%), and socio-economic effects (42%).

In a supplementary question, respondents were asked whether EA should be extended to cover other areas and sectors that presently lie outside the mainstream process. The main points to emerge here were:

- slightly less than one-half of the respondents believe that the EA process should include global changes, and one quarter are unsure, perhaps reflecting the concerns about ineffectiveness in examining smaller-scale cumulative effects; and
- a majority of respondents consider that international trade agreements (57%) and industrial processes and products (77%) should be subject to formal EA.

Table 4.6: Adequacy of Consideration of Key Issues

Q How effective is the examination usually given to the areas listed below in environmental assessment? Rated according to the following scale:

A. excellent (thoroughly and competently performed)
B. good (minor omissions and deficiencies)
C. satisfactory (some omissions and deficiencies)
D. poor (significant omissions and deficiencies)
E. very poor (fundamental flaws and weaknesses)
F. no opinion (insufficient basis/experience on which to judge)

	A	B	C	D	E	F
• Problem definition	6%	33%	38%	14%	4%	6%
• Objectives/terms of reference for impact analysis	3%	26%	41%	21%	4%	6%
• Development alternatives	3%	13%	29%	37%	12%	6%
• Cumulative effects	2%	6%	20%	41%	25%	7%
• Socio-economic effects	2%	14%	31%	32%	10%	10%
• Transboundary issues	1%	6%	20%	32%	20%	21%
• Policy, plans and programmes	2%	15%	24%	25%	25%	10%

4.1.5 The Effectiveness of Assessment

The focus in this section is on four key questions regarding EA effectiveness:

- the provision of information for decision making and the relative contribution of assessment tasks;
- the extent to which EA influences decision making;
- the overall results of the EA process as indicated by environmental protection benefits; and
- the extent to which EA is a learning process that has other instrumental and policy benefits.

Aspects of Success and Shortfall

In Table 4.7, seven parameters of successful EA performance are identified. These are rated by respondents against a four-part scale, ranging from "very successful" to "unsuccessful". In sequence, the measures of success lead from appropriate scope of application, through assessment capability for key tasks or functions, and conclude with the provision of relevant information and advice to decision making. Respondents' views indicate the relative and overall aspects of success and shortfall as follows:

- EA is recognized by the majority of respondents as being moderately successful or better in including a full range of considerations, in identifying appropriate mitigation measures, and in providing clear, understandable information to decision makers on the potential consequences of development proposals;

- current practice is considered to be weaker (marginally or not successful) in making precise, verifiable predictions (by 60% of respondents), in indicating confidence levels for data used in impact prediction (75% of respondents), in specifying the significance of residual impacts (64% of respondents), and in providing relevant advice to decision makers on alternatives (53%).

Table 4.7: Aspects of Success

Q To what extent are assessments usually successful in the following areas?

	Very Successful	Moderately Successful	Marginally Successful	Not Successful
• Including a full range of considerations (e.g., social, ecological, risk, etc.)	11%	53%	27%	6%
• Making precise, verifiable predictions	2%	34%	45%	15%
• Identifying appropriate mitigation measures	12%	57%	24%	3%
• Indicating confidence levels for data used in predicting impacts	3%	17%	43%	32%
• Specifying the significance of residual impacts	3%	28%	45%	19%
• Providing clear, understandable information for decision makers on the potential consequences of development proposals	14%	51%	26%	8%
• Providing relevant advice to decision makers on alternatives to the proposal being assessed.	8%	34%	37%	16%

Influence on Decision Making

Table 4.8 indicates the influence that EA is perceived to have on decision making. Seven dimensions of success were evaluated by respondents according to a four-point scale, ranging from "very influential" to "no influence". Of particular note are the following:

- EA is considered by most respondents to be very or moderately successful in ensuring that a full range of environmental considerations is taken into account in decision making (67% approval), but judged to be marginally or not successful in ensuring social factors are taken into account (by 55% of respondents);
- the process is perceived to be very or moderately influential in redesign of proposals (by 56% of respondents) but less successful in siting of proposals (58% of respondents consider EA to be of marginal or no influence) -- though the margins in both cases are relatively slim; and
- a majority of respondents see EA as very or moderately influential in establishing terms and conditions of approval (72%), but as having marginal or no influence on ensuring appropriate follow up arrangements are in place.

These latter findings, in particular, help to qualify earlier responses regarding the inadequacy of the follow-up component of EA (though it is not clear whether the above response implies that monitoring and other measures are recommended in EIAs/reports but not acted upon by decision makers).

Table 4.8: Influence on Decision Making

Q How much does assessment usually influence decision making?

	Very Influential	Moderately Influential	Marginally Influential	No Influence
• Ensuring environmental considerations are fully taken into account	23%	46%	25%	2%
• Ensuring social factors are fully taken into account	10%	30%	43%	12%
• Ensuring risks are fully taken into account	12%	43%	35%	6%
• Redesign of proposals	14%	42%	32%	8%
• Siting of proposals	12%	36%	33%	15%
• Establishing terms and conditions for development approval	27%	45%	20%	4%
• Ensuring appropriate arrangements are in place for:				
- verifying implementation	9%	29%	45%	12%
- monitoring effects	10%	28%	46%	11%
- managing unanticipated impacts	6%	16%	46%	27%

Overall Results

In Table 4.9, the concern is with the overall results of EA as perceived by respondents. Six important benefits that can be realized through the application of the EA process are rated as to their frequency of delivery. A five-point scale is used, ranging from "always achieved" to "never achieved". Key findings include:

- EA is considered often or always to contribute to informed decision making by 70% of respondents, and to prevent environmental damage (54% positive rating);
- by contrast, the process is judged less successful in minimizing impacts to as low as practicable levels (only one-third of respondents considered it does so always or often), in avoiding irreversible changes (18% gave high grade ratings), and in ensuring that development is placed on a sustainable basis (40% consider this result occurs seldom or never).

These interpretations need to be placed in the perspective of an "ascending staircase" of results that become progressively more difficult to deliver, and the recognition by a near majority of respondents (49%) that benefits always or often outweigh the costs of application.

Table 4.9: Overall Perceptions of Benefits

Q What are the overall results of assessment?

	Always	Often	Sometimes	Seldom	Never
• Contributes to more informed decision making	28%	42%	27%	3%	0%
• Prevents environmental damage/social losses beyond what would be achieved without assessment	16%	38%	38%	6%	1%
• Minimizes impacts of development "to as low as reasonably practical"	5%	28%	44%	19%	2%
• Avoids irreversible changes	3%	15%	50%	25%	4%
• Ensures development is placed on a sustainable basis, (i.e., within thresholds of ecological tolerance and social acceptability)	4%	15%	39%	31%	9%
• Benefits outweigh the costs of application	17%	32%	31%	14%	3%

Assessment as Learning

In Table 4.10, the pattern of response helps to clarify the idea of EA as a learning process that has important secondary and long term achievements, i.e., beyond informing decision making and achieving environmental protection. Four such benefits, widely considered to occur, are evaluated by respondents in terms of the significance of change that is attributable to assessment. A positive profile emerges. The great majority of respondents consider EA to be a learning process that leads to greater awareness of environmental concerns (89% recognize significant or moderate changes in this regard), upgraded professional capabilities (81% positive rating), better coordination among agencies (76% positive rating), and improved acceptance of public involvement (72% positive rating).

Table 4.10: Assessment as Learning

Q Is assessment a learning process for practitioners and participants that leads to the following changes?

	Significant Change	Moderate Change	Marginal Change	No Change
• Greater awareness of environmental/social concerns	46%	43%	9%	0%
• Upgraded professional and technical capabilities	28%	53%	15%	2%
• Better coordination among agencies/individuals	29%	47%	19%	4%
• Improved acceptance of public involvement and input	27%	45%	22%	4%

4.1.6 Conclusion: The Respondents' Report Card on EA

In this section, the previous findings are pulled together in the form of a short report card on EA as reflected by respondents' answers.

- *Adequacy of institutional arrangements: (C)*

These are judged satisfactory overall by respondents, with main strengths seen in the legal/policy base, the scope of application, and the provision for public participation. Evident weaknesses include technical guidance and requirements for monitoring and for addressing cumulative effects and sustainability issues.

- *Scientific and methodological base: (C+)*

Reasonably satisfactory. Except for support research, key elements are considered to have been moderately strengthened (e.g., methods, data sources, information systems). The

underlying state of the contributing sciences seriously limits the capability to address cumulative effects. Greater diligence is needed in applying "state of the art" science to assessments.

- *Conduct of assessment: No composite grade*

B- for better than satisfactory performance of steps and activities at the pre-decision phase. D for poor performance in the need to be significantly upgraded (see also institutional arrangements). Mixed performance with respect to process challenges (e.g., examination of alternatives is considered to be weak compared to terms of reference setting). Poor efforts at incorporating cumulative, transboundary and socio-economic effects.

- *Contribution to decision making and environmental protection: (C+)*

Clear passing grade in meeting basic tests of providing consequential information for decision making, in ensuring environmental considerations are fully taken into account, contributing to informed choice, and, more questionably, in establishing terms and conditions for development approval. The EA process is also considered to result in environmental protection benefits, but is perceived as stopping short of providing real safeguards, e.g., avoiding irreversible change or ensuring development is sustainable. However, achieving sustainability requires "across-the-board" policy and institutional reforms. In this regard, the long term changes in awareness that are seen as occurring from participation in EA may possibly contribute to this broader shift.

The important point to remember about these findings is that the respondents, by reason of their specialization, tend to be self-critical. This point came out strongly in a small number of "exit interviews" with people who completed the questionnaire. Also, what is presented here is an aggregate profile that obviously masks considerable variations (e.g., among countries with respect to institutional frameworks). What should be kept firmly in sight is that, first, the standard of EA practice has improved in the last five years (80% of respondents consider the progress made to be moderate or better). Second, there is considerable room for improvement, which everyone knew but it is useful to have confirmed together with an identification of consensus areas for further attention.

4.2 Country Status Reports

Country status reports are a primary means of gathering information directly from EA agencies responsible for process administration at the national and international levels. The elements to be covered include:

- the institutional framework of EIA laws, policies and regulations;
- the processes and procedures for implementing this activity; and
- the overall use and results of EIA in relation to decision making.

A questionnaire was used to gather information. The development and administration of the survey was lead by the Netherlands National Commission for EIA. The questionnaire was distributed in September 1995 with eighteen countries and two international organizations

responding in sufficient detail to warrant processing and comparison.[3] The reports thus give indicative rather than comprehensive coverage. In the following analysis, too, space permits only certain responses to be highlighted. (The intention is to make the full summaries available separately, and to include tabulated information in the effectiveness study data bank which is maintained by the Australian Environment Protection Agency).

4.2.1 Institutional Arrangements

Key aspects of the institutional arrangements as they bear on EIA effectiveness include whether the process is based on law or administrative provision, whether compliance with the process is voluntary and mandatory, and the scope of application, including types of decisions and activities that are subject to assessment.

Also of note in this regard are three other factors:

- length of experience with EA;
- whether major changes to the process have been made or are elaborated; and
- if the country is a signatory to international laws and agreements that may have a bearing on EIA application.

Legal Provisions and Requirements

In the large majority of jurisdictions polled, EIA has a statutory basis (see Box 4.2). This either takes the form of a separate act (e.g., Canada, Korea), or an amendment or provision under separate or framework environmental law (e.g., Indonesia, Malaysia). Several countries and international organizations operate under Cabinet Directive or equivalent administrative order (e.g., Japan). Of note is the number of countries that operate under both legal and administrative provisions. For example, Finland has both a separate EIA law and amendments to 12 existing acts and two decrees. Despite variations among countries, only two jurisdictions reported that compliance with the EA process was voluntary rather than mandatory (and one of these, South Africa, noted it is working toward the latter objective).

Box 4.2: Legal/Administrative Basis of EIA

	No. of Countries
• Separate law	8
• Amendment(s) to existing act	9
• Included under other planning or regulatory processes	4
• Policy directive	5
• Other	2

[3] The following countries and international organizations responded in detail to the questionnaire: African Development Bank, Australia (3 including states), Canada, Denmark, European Commission, Finland, Germany, Hong Kong, Indonesia, Ireland, Israel, Japan, Korea, Luxembourg, Malaysia, the Netherlands, Norway, and South Africa. Many of these also filed source documents and other information relating to laws, regulations, processes and guidelines with the Netherlands EIA Commission.

Scope of Application

The scope of EA application by the responding countries and organizations is summarized in Box 4.3. Key points include:

- EA process applies to private and public sector initiatives in almost all cases, and to development assistance projects in many of the donor countries (and recipients in the case of Indonesia);
- slightly less than half of the jurisdictions apply EA at the strategic level and especially to plans and programmes;
- in the large majority of cases, EA is applied only to activities likely to significantly affect the environment; and
- consequently most jurisdictions limit the process only to full or comprehensive EA and have no provision for preliminary or screening-type assessments.

Box 4.3: Scope of EIA Application

	No. of Countries
Types of Decision	
• Private sector initiatives	19
• Government initiatives	19
• Development assistance projects	9
• Other	1
Levels of decision	
• Projects	20
• Strategic	9
- policies	5
- plans / programmes	8
- other	1
Types of activity	
• All activities likely to affect the environment	4
• Only activities likely to significantly affect the environment	15
• Other	2

Other Aspects

In the large majority of jurisdictions surveyed, the EA system had been in place for more than five years. Most jurisdictions had signed the UN conventions on biodiversity and climate change, the Espoo Convention (for UNECE member states), and a number of other international agreements with implications for transboundary assessment. Examples cited included UNECE Conventions on Industrial Accidents and Protection and Use of Transboundary Watercourses and International Lakes, the Arctic Environmental Protection Strategy, and the Protocol on Environmental Protection to the Antarctic Treaty.

Approximately two-thirds of the jurisdictions surveyed had either made major changes or were undertaking proposed reforms to their EA process. Supplementary information provided indicates a considerable range of activities in response to various national and international requirements. Examples included: new procedures pursuant to the EC Directive (e.g., Denmark, Netherlands), draft EIA Bill (Hong Kong), proposals to amend the EIA Directive and establish a Directive on assessment of plans and programmes (European Commission), and issuing new regulations or amending existing ones (e.g., Canada, Indonesia).

Overview

Three process-wide aspects are considered particularly relevant to EA effectiveness:

- *Scope of environmental effects that can be addressed:* All the jurisdictions polled assess direct and secondary effects, three-quarters include cumulative effects in their review, and only over two-thirds can or do take account of large scale regional or global changes and of biodiversity and other sustainability considerations (see Box 4.4).

Box 4.4: Effects and Issues Addressed in EA

	No. of Countries
• Direct effects	20
• Secondary (indirect) effects	20
• Cumulative effects	15
• Large-scale regional/global effects	14
• Biodiversity effects	13
• Sustainability considerations	13
• Other	3

- *Range of factors that can be considered:* The large majority of jurisdictions include social, health, risk, and, to a lesser degree, economic factors as part of assessment. Other factors that are taken into account include cultural-historical heritage, archaeology, visual impact, material assets, land use by indigenous peoples, community structure, and landscape (see Box 4.5).

Box 4.5: Factors Addressed in an Assessment

	No. of Countries
• Environmental (biophysical)	20
• Social	14
• Economic	13
• Health	17
• Risk	16
• Other	9

- *Level at which proposals can be subject to review*: All of the jurisdictions surveyed reported that the scope of assessment includes alternatives. Slightly under three-quarters take into account the need/justification for a proposal, and combinations of impact-mitigation, project design and environmental compensation (Box 4.6).

Box 4.6: Level at which Proposals are Reviewed

	No. of Countries
• Need/justification of proposal	14
• Alternatives to the proposal	20
• technological alternatives	17
• locational alternatives	17
• no specified alternative given	2
• Project redesign	16
• Impact mitigation	19
• Environmental compensation	12
• Financial compensation	7

4.2.2 EA Process Steps and Components

A well founded EA process, in which steps and activity are interdependent and reinforcing, is acknowledged as an enabling condition of effective performance. The extent to which the "main pattern", identified in Chapter 2, is replicated in the jurisdictions surveyed is shown in Box 4.7. The key parties involved at each stage are also shown. How their responsibilities are allocated and exercised can have a critical bearing on EA effectiveness. Specifically, on a process-wide basis, provisions for public involvement, for oversight and guidance by the EA-responsible agency and for technical advice by expert departments are widely considered to be critical determinants of good practice.

As shown in Box 4.7, the opportunities for public involvement are concentrated at the scoping and reviewing stage. There are three main levels of provision for public involvement in the communities surveyed:

- almost all provide for consultation (i.e., in which public views are solicited and noted), though in a few instances this process is not open to the community at large;
- most jurisdictions also provide for participation (i.e., defined as a more interactive form of involvement), though, in a few instances again, this process is not open to the community at large; and
- in a small number of countries, alternative forms of dispute settlement are used formally or informally (e.g., Canada, Denmark, Hong Kong, Germany, Indonesia).

Box 4.7: EA Process Steps and Parties Involved

Steps	No Answer	No	Yes	If yes, parties involved: Competent Authority	Environmental Authority	Public	Expert Committee	Initiator	Other
Screening	--	3	17	14	11	3	2	8	--
Scoping	--	2	18	14	14	9	5	11	--
Analyzing/ predicting	1	--	19	7	6	2	5	16	--
Reporting	--	1	19	5	5	--	2	15	--
Reviewing	2	1	17	13	15	12	7	5	--
Decision making	1	--	19	16	6	--	2	2	2
Monitoring**	--	7	13	7	7	--	1	10	--
Managing**	4	7	9	4	4	--	--	5	--
Auditing/ Evaluating**	4	10	7	5	5	--	1	4	--

** Part of follow-up

With respect to the role of other key parties, the large majority of countries consulted have provisions relating to the role and responsibilities of an environmental agency. In most cases, this term will refer to a national department of the environment or equivalent body, but certain countries also have dedicated agencies which are responsible for EA process administration (e.g., Canada) or the quality of studies and reports (e.g., Netherlands). Environmental authorities, generally, have a major role at the screening/scoping and report review stages, corresponding to the pattern of public involvement described above. However, to a lesser degree their role also extends throughout the process. By contrast, the use of expert committees and similar review mechanisms, outside of those monitored by an initiating or action agency, occurs primarily at the EA report and acceptance stages.

Guidance and support measures are recognized as exerting an important bearing on EA effectiveness. In the jurisdictions surveyed, three-quarters have formulated procedural guidelines that provide direction and advice on what needs to be done to meet basic provisions and requirements, and 50% provide technical guidance on how EA should be undertaken consistent with good practice. The latter take the form of codes of practice, manuals, and sourcebooks, with Germany perhaps standing out as providing particularly comprehensive technical and procedural guidance. Box 4.8 provides an overall breakdown of the application of procedural and technical guidance for different stages and aspects of the EA process. Finally, three-quarters of the jurisdictions consulted reported they either undertake or directly support ongoing EA research for purposes of process development and strengthening methodological and procedural guidance, and a slightly lesser number also undertake or directly support EA training and education activities.

Box 4.8: Activities and Aspects of EIA Addressed in Procedural and Technical Guidelines

Components/Aspects	No Answer	No	Yes	Procedural	Technical
Screening	3	3	14	13	5
Scoping	3	3	14	12	6
Impact analysis/prediction	3	6	11	7	6
Mitigation	3	9	8	5	5
Examination of alternatives	3	6	11	7	5
Determination of significance	3	6	11	9	7
Monitoring	3	11	6	4	3
Impact management	3	11	6	3	4
Process evaluation	3	12	5	5	2
Public consultation	3	8	9	9	3
Social impacts	3	11	6	4	3
Economic impacts	3	11	6	4	3
Cumulative effects	3	11	6	4	4
Sustainability	3	12	5	2	2
Biodiversity	3	12	5	2	2
Other	3	14	3	2	--

Screening involves the determination of whether or not an individual proposal (project or policy) requires further assessment and at what level of detail. Not all of the jurisdictions surveyed apply a formal procedure for this purpose (e.g., Japan, Korea, and the European Commission do not undertake screening). The majority of agencies report using a combination of lists (with or without thresholds) that identify the types of proposals requiring assessment and case-by-case review. In the latter case, there is reference to both general significance criteria and list of resources, features, and areas of particular importance or sensitivity (see Box 4.9). The overlaying of lists with case-by-case mechanisms using scientific criteria provides for a more comprehensive and focused approach.

From an effectiveness standpoint, it is also important that reasons for screening decisions should be transparent and defensible. This may be a shortfall in a number of jurisdictions surveyed. In more than half of the cases, the screening process does not appear to result in a formal decision that is published. A number of the development banks are currently reviewing their screening procedures in the light of past inconsistencies in project classification decisions. One possible means of resolving this issue is to introduce case-specific screening mechanisms as above, but the problem also confirms the importance of public scrutiny and oversight.

Scoping is the vital early step in the EA process that establishes the key issues to be addressed in a study and the framework of approach that will be taken. With two exceptions, the jurisdictions surveyed apply a process of scoping. Most have specific requirements and criteria for this purpose. The majority of countries use scoping to identify significant impacts, key issues, alternatives to a proposal, and, to a lesser degree, the affected and interested population groups. Although there are considerable overlaps in some jurisdictions between screening and scoping, the latter process is both more open and study-specific than the former.

Box 4.9: Screening Mechanisms	No. of Countries
• List of activities with significant environmental effects	13
• with the threshold values (e.g., extent of the activity, emission levels, standards)	9
• without threshold values	5
• Case-by-case screening mechanism	13
• General criteria	9
• List of resources or areas of special importance or sensitivity	7

Commonly, scoping results in the preparation of terms of reference or guidelines for the preparation of an EA study. The results of this process take a number of specific forms, however. In half of the jurisdictions surveyed, formal published guidelines are prepared on the basis of the scoping exercise. Of these, 50% report the guidelines are binding on proponents and 50% issue guidelines that are advisory. The remaining jurisdictions either do not document the results or issue an advisory report that is not published. Whether formal or informal, the test of effectiveness of scoping-based guidelines are their usefulness and robustness as demonstrated by successive stages of the EA process. This is a focus of concern for most countries participating in the effectiveness study (and is the subject of further review in Chapter 5).

Reporting involves the preparation of an environmental impact statement (EIS) or an equivalent document for decision making. The EIS or report also serves as the main channel of communicating the results of the study phase to a wider audience including the affected public. With one exception, all of the states and organizations surveyed have specific requirements for the content of an EA report. Many aspects tend to be jurisdiction-specific, but there are a number of elements in common. Box 4.10 describes the aspects that are typically included in the context of the EIS or EA report.

Box 4.10: Aspects Usually Included in Reporting a Comprehensive or Detailed Assessment	No. of Countries
• Need/justification	16
• Baseline conditions/existing quality of the environment	19
• Prediction/estimation of environmental impacts/risks of proposal	19
• Probable effect on impacted public	16
• Prediction/estimation of indirect and cumulative impacts	14
• Examination of alternatives	18
• Mitigation measures	19
• Evaluation/determination of the significance of effects	17
• Recommendation on terms and conditions of approval	11
• Arrangements for monitoring and post decision analysis	14
• Arrangements for physical or financial compensation	4
• Other	3

Review of the quality of the EA report is undertaken primarily to determine the adequacy, sufficiency and relevance of the information as a basis for decision making. This stage is formally carried out after a draft EA report has been filed but "monitor and check" types of review may extend throughout a comprehensive EA process. With a few exceptions, various review mechanisms are in place in the jurisdictions surveyed. The main breakdown is between countries with provisions for external versus internal review (see Box 4.11). However, many jurisdictions use two or more procedures depending on the type of process that is followed (e.g., Canada has various provisions for in-government review of screening and comprehensive studies and for independent review by EA panel and mediation).

Box 4.11: Mechanisms for Review of Quality of an EIS/EA Report

	No. of Countries
Internally:	18
• Inter-agency review	7
• Environmental authority	14
• Competent authority responsible for the proposal	11
• Other	5
Externally:	
• Independent review board or commission	5
• Mediation provision	2
• Other (e.g., national or local planning authority)	3

In the case of external review, the two main models are the appointment of an EA panel or equivalent board of inquiry (e.g., Hong Kong), and the establishment of a standing commission or other permanent body (e.g., the Netherlands). Both processes provide for independent, expert and public review, typically securing views and information from all interested parties in the case of large scale, controversial proposals. These processes, though relatively limited internationally to a small number of countries, are widely seen as setting the highest standards of objective review. However, it should be recognized that internal procedures often can be equally rigorous and expert (e.g., by inter-environmental authorities), and that the local and national competent authorities in some countries consult informally with a number of interested parties (e.g., Finland, Ireland).

Specific requirements for undertaking the review of the quality of an EA report are in place in approximately 50% of the jurisdictions surveyed. A key provision in this regard is for documentation and publication of the results of review. The record is somewhat mixed on this front (see Box 4.12). In some cases, specific requirements depend on the process that is followed. Although procedural standards for review of EA reports are fairly well understood, good practice guidance is not. (This issue is pursued further in Chapter 5).

Box 4.12: Results of the Review Process

	No. of Countries
• Results not documented	5
• Advisory document, not published, for internal use only	6
• Formal non-binding document which is published	6
• Formal binding document which is published	4
• Other	3

Follow-up includes the complement of activities that are applied to oversee and check on the implementation of terms and conditions of approval, providing for both quality control and environmental management response to ongoing activities. This phase of the EA process was identified earlier in responses to the IAIA questionnaire as an area of systemic weakness. Key points to note from the status reports are that:

- effects monitoring is a requirement in over half of the jurisdictions consulted;
- impact (or environmental) management and, more so, audits are less widely undertaken;
- surveillance of implementation of terms and conditions and process audit and evaluation are undertaken in only a handful of the countries polled; and
- the end results of follow-up programmes are not always documented and are publicly available in less than one-quarter of the jurisdictions.

This documentation is critical to learning from implementation and dissemination of the lessons. On a wider front, the further specification of good practice in follow-up is identified as a priority in the countries participating in the effectiveness study and is considered further in Chapter 5.

EA Activities and Results

The focus in this section of the country status report is on the outcomes of the EA process. In particular, jurisdictions were asked to estimate or specify the number of EAs processed, the number and consequence of decisions that were taken following their completion, and time and costs involved in documentation and related activities. Such information is critical to judgments about EA effectiveness and performance. However, it was also evident in preliminary discussions with participating countries and organizations that the requisite data were not available or were difficult to compile into a ready to use format. As expected, all jurisdictions had some difficulties in answering (not all questions were completed), and the following responses should be interpreted cautiously as "best-guess estimates".

- *Number of EAs undertaken*: The breakdown of activity per country is summarized Box 4.13. Of note, three countries processed more than 1000 EAs during 1994 (e.g., Canada, Germany, Indonesia). At the other end of the spectrum, three jurisdictions processed less than ten EAs (e.g., South Australia, Finland). The mid-range is made up of EA systems that process up to 100, and between 100 and 500 assessments possibly represents the average range of international experience. In this regard it is important to remember notable

differences are introduced by countries that provide for staged assessments (e.g., South Africa where 90% of EAs are of the preliminary type) compared those that provide only for full-scale review (e.g., Japan).

Decision making in relation to EA: The estimated number of decisions following assessment is also given Box 4.13 for the jurisdictions surveyed. Note the correspondence is not necessarily one-to-one largely because of the lag between completion of EA and the recorded decisions in over the calendar year. Of greater consequence is the estimated percentage of proposals subject to EA that were approved with little modification (five states indicate 80-100% of all purposes are in this category and three reported none were), approved with moderate or high modifications (five jurisdictions report 60-100% of all proposals fall into this category), reflected (five states estimate that between 1-20% of all proposals are in this category), withdrawn prior to approval (six countries report this occurs for between 1-20% of all proposals).

Box 4.13: EAs Undertaken and Decisions Taken, 1994

Range	No. of Countries Reporting	
	EAs Processed in 1994	Decisions Taken in 1994
• No answer	3	3
• 1-10	3	6
• 11-99	6	6
• 100-499	5	3
• 500-1000	-	-
• >1000	3	2

The estimates, as given, were in 10-20% "band-widths" and clearly represent very approximate yardsticks. It is of interest that none of the countries that process large numbers of EAs (+1000) were able to give any estimate of their relation to decision making. Although the estimates should be treated very cautiously, they do point toward the range of bearings that EA process have on decision making and are not inconsistent with other findings or the viewpoints expressed by IAIA members and others. However, it is doubtful whether too many countries share the experience of more advanced EA systems (e.g., Netherlands with estimated 80% or proposals subject to major or moderate modification).

- *Cost-effectiveness considerations*: The jurisdictions surveyed were asked to estimate approximate length of EA reports and statements, and the average time and cost of completing these in 1994. Half of the respondents were unable to supply cost information, and there was a significant level of non-response to the other questions. Information is tentative but several useful perspectives emerge as described below.

- *Approximate length of EA reports:* The reported incidence of short reports (under 50 pages) is relatively low. Five jurisdictions report that up to 20% of EAs are over 400 pages long. The majority of reports fall in the interim length categories (51-99 pp, 100-199 pp, 200-400 pp) with no discernible pattern.

- *Approximate time taken to complete EAs:* In a few jurisdictions, all or most EAs are processed in under 6 months. At the other end of the scale, three jurisdictions report that up to 40% of all proposals take more than two years for clearance. Generalizing, most EAs in most countries are completed in under 18 months, and a significant percentage take less than 12 months.

- *Average cost of preparation of EA reports:* Five jurisdictions report that up to 20% of reports cost less than $25,000. At the other end of the scale, six countries report that up to 20% of reports cost more than $100,000. Generalizing broadly, most EAs in most jurisdictions that supplied information appear to be completed for less than $75,000. However, the basis on which these estimates were costed is not clear, although they are not out of line with other figures reported earlier.

4.2.3 Status of Practice and Future Developments

Two trends are evident from the above analysis:

Significant developments in EA: There was a wide range of response to this open-ended question. Many of the trends listed were country-specific. However, several stand out:

- introduction of new or modified laws, directives and regulations, e.g., relating to SEA;
- strengthening public involvement procedures;
- issuing guidance on the conduct of assessment; and
- various measures to formalize the EA process in relation to decision making and levels and types of activity reviewed.

Pressing issues and emerging challenges: Approximately 60 items are identified in the country status reports. The most common challenges are:

- improving the quality of the EA practice, e.g., by establishing monitoring, review, and other control procedures;
- securing a more cost-effective process;
- further strengthening of public involvement; and
- greater emphasis on training, cooperation and professional development activities.

4.3 Corporate Frameworks of EA

Modeled on the country status questionnaire, a survey of the corporate use of EA was sent to approximately 65 major corporations. Many of these are member companies of the World Business Council on Sustainable Development and participated in drafting the statement on EA. The survey was administered and the results collated by the New Zealand Natural Gas Corporation on behalf of the effectiveness study. In total, 33 completed questionnaires were returned, a return rate of 50%. The information contained in the following section, again, is only indicative of trends and developments in corporate response to formal requirements for EA and

to the internal use of this process for business decision making. However, they contain much of interest on what to date is a little known area of EA practice.

4.3.1 Key Findings

Basis and application of EIA policy: In most of the companies polled, the basis of EIA policy combines a number of features. The main platforms are:

- as required by national laws and regulations (63%);
- component of environmental management systems (52%);
- included under other processes (36%);
- no set policy (21%); and
- separate guidelines (6%).

Other processes cited include planning, safety, siting studies, land acquisition, consents, construction planning, safety and hazardous operations. The majority of companies (66%) apply EIA in cases where there is no regulatory requirement to do so. In cases where EIA is required 88% of company processes are reported to exceed minimum requirements. This reportedly occurs often (45%), sometimes (24%), and occasionally (12%).

Experience and recent developments: About one-half of the companies have used EIA for between ten and 20 years, and several have used it for more than 20 years. Almost two-thirds either reported making major changes recently to EIA policy and methods or were proposing such reforms. Many of the changes made or proposed were in response to industry - or company-specific developments. But a considerable number of reforms were contingent upon the adoption of new environmental legislation and EIA and planning requirements in the countries of operation, (e.g., Canada, Taiwan, China, New Zealand, and Australia). There was also reference to new sector-specific requirements (e.g., forestry and energy in British Columbia).

Objectives: Commonly stated EIA-related objectives and priorities include the need to:

- comply, as a minimum, with environmental regulations and guidelines, as well as with standards imposed by the companies themselves;
- ensure that environmental values were identified, assessed and safeguarded;
- give environmental considerations due priority in project planning; and
- act as good corporate citizens who are, and are seen to be, socially and environmentally responsible.

References were also made to the importance of sustainable development, health, safety and risk analysis, the conservation of valuable resources, requirements for public disclosure of information on new projects and the need to encourage better public understanding and wider public acceptance of new developments.

Scope of EIA application: The scope of application was reviewed by reference to both level of decision making and type of activity. In terms of level of decision making, the main categories

covered were projects (90%), policies (28%), plans/programmes (47%), products (25%), and other (12%) (e.g., site activity). With regard to types of activity, three categories stand out as important activities requiring legal consent/permit (81%), activities likely to affect the environment (69%), and activities likely significantly to affect the environment (59%).

4.3.2 Corporate EIA Processes

The corporate EIA processes reviewed typically include a range of factors in addition to environmental (biophysical) considerations. A large majority of the companies polled cover risk (84% of respondents), social (81%), health (76%), and economic (63%). Other factors cited by one or two companies included dangerous goods and hazards assessment, archaeology, land use conflicts, scenic values and cultural aspects.

The type of issues that are (or can be) addressed also are similar to those found in formal, public sector EA systems. The breakdown of reported responses indicates a high percentage of impact categories are covered by the corporate EIA systems, namely direct effects (100%), cumulative effects (72%), sustainability considerations (66%), biodiversity effects (60%), large scale regional/global effects (45%) and other (6%), including eco-efficiency, scenic values and cultural values.

The scope of assessments undertaken by the companies polled was unusually broad. Key aspects considered included need/justification of proposal (75%), alternatives to proposal (78%), technological alternatives (69%), locational alternatives (60%), project redesign (69%), impact mitigation (90%), environmental compensation (57%), and financial compensation (15%).

As expected, the steps undertaken in corporate EIA processes correspond to the so called "main pattern" identified in Chapter 1. Further details of practice at each stage are given below. However, an important difference to note is the emphasis given to the pre-decision phase compared to follow-up mechanisms. Except for monitoring, which is undertaken by 90% of the companies polled, managing, auditing and evaluating activities have a lower prominence as part of EIA, though these are still undertaken by 52% to 58% of respondents and some aspects are covered under more comprehensive management systems.

4.3.3 Process and Procedure Step by Step

Screening is undertaken by 75% of the companies polled. A breakdown of the mechanisms used are given in Box 4.14. More than one-half of the companies responding use more than one mechanism.

Box 4.14 Screening Mechanisms Applied by Industry

- List of activities that have a significant environmental effect (21)
- With threshold values, e.g., emission levels standards (10)
- Without threshold values (12)
- List of resources or areas of special importance or sensitivity (14)
- General criteria (12)
- Case by case screening mechanism (11)

(Note: numbers reflect data provided by total of 25 companies)

Scoping is undertaken by 90% of the companies polled. The aspects identified in the scoping phase are listed in Box 4.15. Of particular note perhaps, is the prominence given to alternatives in scoping, with 75% of companies focusing on this aspect as well as key issues and impacts.

Box 4.15 Aspects Identified in Scoping in Corporate EIA

- Significant impacts (28)
- Key issues (27)
- Alternative to the proposal (23)
- Affected and interested publics (20)
- Terms of reference/guidelines for preparing a comprehensive EA (16)

(Note: numbers reflect data provided by 30 companies)

Comprehensive or detailed assessment is undertaken by all companies polled. Box 4.16 provides details of the main activities and elements included in the corporate EIA process. Two aspects stand out, the large majority of companies (83%) that address project justification as part of EIA, and the large minority of companies (47%) that do not make recommendations on terms and conditions as part of EIA.

Box 4.16 Aspects Covered in Comprehensive EIA of Industry

- Need/justification of proposal (25)
- Baseline conditions/existing quality of the environment (26)
- Prediction/estimation of environmental impacts/risks of proposal (30)
- Probable effect on impacted public (22)
- Prediction/estimation of indirect and cumulative impacts (22)
- Examination of alternatives (22)
- Mitigation measures (26)
- Evaluation/determination of the significance of effects (28)
- Recommendation on terms and conditions of approval (16)
- Arrangements for monitoring and post-decision analysis (20)
- Community and interest group consultation (24)

Evaluating significance is a focal task in determining impact acceptability. Specific requirements and/or criteria are used by approximately 50% of the companies polled. The remainder appear to rely solely on case-by-case expert and consensual judgment. Examples of requirements and/or criteria mentioned include company safety and environmental quality objectives, policies and requirements laid down by governments, ambient standards and threshold limits for acceptable impacts, and water, air, soil quality, land use, and noise regulations.

Opportunities for public involvement during EIA process are provided by 75% of the companies polled. The spectrum of reported activities includes both consultation (carried out by 23 of 24 companies), and participation or working interaction with public groups (54% of companies).

Public involvement occurs at all stages of the EIA process operated by one-third of companies and only at particular stages in other cases. A number of companies, approximately one-fifth of these responding, have used alternative forms of dispute settlement, including mediation and arbitration.

Post-approval analysis or follow-up is undertaken in some form by almost all the companies polled. As noted earlier, monitoring is the most widespread activity, and 80% of the respondents implement effects monitoring programmes as required. There is also a strong emphasis on environmental management audits (reported by 83% of companies), compared to EIA-specific surveillance and process audit (reported by 42% of companies respectively).

Responsibility for EIA in the companies polled is divided between the environment and line departments. Box 4.17 provides a breakdown of the accountability for particular stages and activities of the EIA process. Key points to note are the evident co-responsibilities of environment and line departments for EIA in a number of companies, and the comparatively higher prominence of the environment department in administering and conducting EIAs, and its comparatively lower status in formal decision making.

Box 4.17 Responsibility for EIA in Industry

EIA Activity	Environmental Department	Line Department
• Administering EIA procedure	23	12
• Initiating EIAs	19	18
• Conducting EIAs	21	15
• Reviewing EIAs	22	17
• Accepting EIAs	18	18
• Final decision making	11	25

4.3.4 EIA Activities[1]

- *Total number of EIAs undertaken in 1994*: Most reporting companies (25 of 31) had undertaken ten or fewer EIAs in 1994. Four of the remainder had undertaken between eleven and 49, and two between 50 and 100. Of these, a considerable number were "internal" EIAs undertaken for purposes of company decision making rather than in response to government requirements.

- *Relationship of EIA to decision making*: Information was provided by 22 companies on the approximate percentage of proposals subject to EIA requirement in 1994 that were approved, rejected or withdrawn. Of these, eighteen (82%) reported that between 75% and 100% of company proposals subject to EIA requirements were approved with no or minor modifications to the original design. Nine companies (40%) reported up to 25% of proposals were approved with moderate or major modifications to the original design.

- *Time taken to complete EIAs*: Information on this subject was provided by 23 companies. Of these, eleven (44%) reported that 75% to 100% of the EIAs completed by their companies in 1994 had been completed (from screening to final decision) in six months or less. Five companies (22%) reported that up to 25% of their reports took between 13 and 18 months to complete.

- *Average cost of preparing EIA reports*: Information on this subject was provided by seventeen companies. Of these, eight (47%) reported that between 75% and 100% of their EIAs completed in 1994 cost the company $25,000 or less. Three reported that between 75% and 100% of their EIAs cost more than $100,000.

- *Guidance on applying EIA*: Information on this subject was supplied by 31 companies. Procedural guidance is provided by approximately one-half of the respondents. Reference materials include engineering procedures, process guidelines, standard operational procedures and guidelines from regulatory authorities. Technical guidance is also provided by a similar percentage of companies. This encompasses government policy and regulation, impact checklists, standard operational procedures, accepted professional procedures and methodologies, and resource-specific codes and manuals of good practice (e.g., for forestry and pipeline construction).

4.3.5 Status of Practice and Future Perspectives

- *Recent developments in corporate EIA*: There was a wide range of responses on this subject. Many of the issues listed were company-specific. The following developments were given most attention:

[1] The number of responses to questions in this part of the survey was significantly fewer than the responses to other questions. Some people noted that they had difficulty answering the questions, and a number noted that they did not have the information the questions required.

- establishment of and progress towards environmental management systems in industry;

- new legislative/regulatory requirements for EIA specifically, and for environmental/resource management generally;
- widespread adoption of corporate environmental policies;
- progress in the integration of EIA in project development;
- greater emphasis on effective community consultation; and
- increasing recognition of need to establish environmental baselines.

- *Pressing issues of corporate EIA practice*: No dominant concerns emerge, but there is some recognizable pattern in the responses. The following issues stand:

  - concern about the cost-effectiveness of the EIA process, including the financial, time and administrative burdens it imposes;
  - demand for better integration of environmental, technical and economic aspects of project planning and development;
  - the need for improved EIA methodologies, greater attention to quantitative analysis and increased objectivity; and
  - the need to refine risk assessment in the light of changing patterns of risk liability.

- *Key emerging challenges for the next five years*: Additional points to those made already include:

  - the implication for the private sector of fast-changing policy and legislative frameworks;
  - the need to work with governments and develop clear and practical guidelines and regulations; and
  - changing social and environmental issues and changing stakeholder expectations and concerns will place additional demands on industry.

4.4 Key Points: Summing up this chapter

For the first time, the status of EA can be gauged against the broad sampling of professional opinion gained through the effectiveness study's surveys of EA practitioners and managers. *A Report Card on EA:*

Respondents to the detailed questionnaire distributed to IAIA members and other EA practitioners suggested that:

- *institutional arrangements:* are judged to be satisfactory overall, with strengths seen in the legal/policy base, scope of application, and public participation;
- *the scientific and methodological basis* for EA is considered to be satisfactory;
- *the conduct of assessment* is given a mixed grade; and

- *the contribution to decision making* and environmental protection is given a passing grade, but is judged to be doing a poor job of providing real safeguards in terms of avoiding irreversible change or ensuring development is sustainable.

Country Status Report

A survey of the institutional framework for EA and its contribution to decision making in 20 countries and organization revealed that:

- EA has a statutory basis in most jurisdictions;
- about two-thirds of the countries and agencies polled had either recently made changes or were proposing reforms to the EA processes; and
- specific provisions for undertaking a review of the quality of EA reports are in place in about one-half of the jurisdictions.

Corporate Experience with EA

An international survey of 33 major corporations indicated that:

- about one-half have used EIA for between 10 and twenty years;
- corporate EIA processes typically include a range of factors in addition to biophysical considerations (e.g., risk, social, health, and economic factors);
- recent trends suggest a move towards environmental management systems, adoption of corporate environmental policies, and greater emphasis on community consultations; and
- there are increased concerns about the cost-effectiveness of the EIA process, including the financial, time, and administrative burdens it imposes on industry.

CHAPTER 5:
EIA PROCESS STRENGTHENING -- FOUR PRIORITIES FOR IMPROVEMENT

This chapter reviews key issues and trends related to strengthening the EIA process in four priority areas: scoping, evaluation of significance, EIS review, and monitoring and follow-up.

"In order to strengthen EIA, practitioners must: emphasize process fundamentals and deliverables; pay greater attention to informing users of the process about these values; keep new developments, such as strategic environmental assessment (SEA), in perspective; and remember the main game is better management of EIA."
Barry Carbon, 1995.

Project EIA remains a core mechanism for identifying and managing the adverse effects of development proposals. Recent experience in many countries confirms that there is still considerable scope for process improvement. The strengths and weaknesses of EIA are well documented in general terms and with reference to the processes and practices of specific countries. Chapter 2 provided an overview of relevant trends and issues. These are also the subject of a considerable literature. Accordingly, the effectiveness study has focused on four priority areas:

- scoping;
- evaluation of significance;
- review of EIS; and
- monitoring and follow-up.

These four priority areas are considered by practitioners to be areas where the project EIA process could be strengthened immediately and cost-effectively. Each area is reviewed in greater depth in the background report published by the Australian Environment Protection Agency (1996a). In this chapter, a review of "good practice" is undertaken, drawing on experience in a number of countries participating in the effectiveness study. Only the main highlights are reviewed here, beginning with a brief review of broad considerations related to process strengthening.

5.1 Perspectives on Process Strengthening

Much of the work reported here began at the 7th Australia-Canada-New Zealand Tripartite Workshop (Australian Environment Protection Agency (1996b)). The project EIA experience of these countries was also the focus of a special issue of the *Australian Journal of Environmental Management* (Vol.2, No.2, 1995). In a critical analysis of EIA in Australia, Brown and McDonald (1995) suggested that the process might have passed its useful shelf life. Their larger point that EIA can and should be part of a more integrated and strategic approach is consistent with Canadian and New Zealand trends (Sadler, 1995a; Dixon and Fookes, 1995). However, it is also important not to lose sight of what Barry Carbon above calls "the main game" -- the better management of EIA.

5.1.1 Process Integrity

Process effectiveness can be equated with problem-solving capability. In brief, this means that project EIA should also address:

- pressing environmental issues and other relevant concerns, including social (community), economic and health factors;
- examination and comparison of alternatives to a proposed project;
- cumulative effects and any potential large scale, ecosystem-level changes; and
- sustainability considerations and implications, e.g., related to assimilative capacity, resource productivity and biodiversity (see Chapter 7).

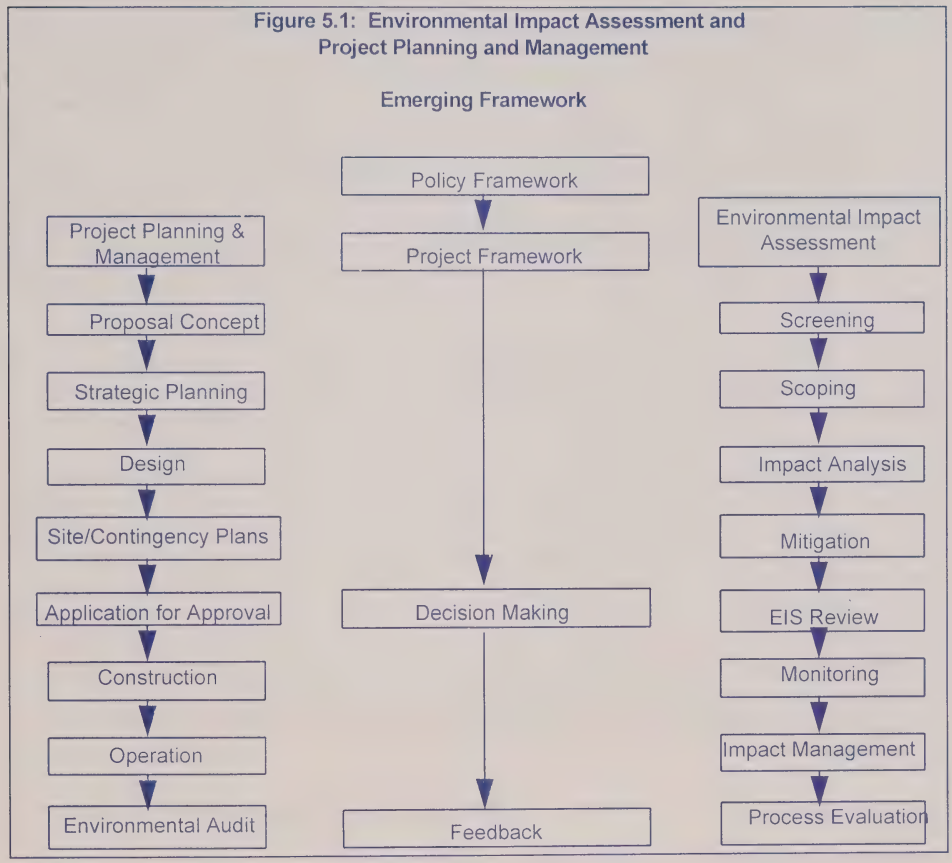
The integrity or unity of the EIA process is seen as an important determinant of its effectiveness. An integrated approach means EIA is appropriately related to the decision making process of which it forms part, and the main operational steps and activities are applied to that end in concert. However, this is easier said than done. First, project EIA is undertaken relatively late in the overall project planning and public policy-making process, and is applied to concrete development proposals (at varying stages of concept and design). This typically raises problems of process integration, both within the policy context and with respect to the project cycle:

- *Policy context*: EIA is typically applied after the foreclosure of broad options, e.g., regarding whether, where and what type of development will take place within a particular sector. Often, these options are developed with minimal consideration of the environment, so that EIA functions at a relatively late stage in the decision making-process. A degree of policy clarification and re-examination can be accommodated (e.g., with respect to alternatives), but the project EIA process generally is not designed to efficiently address these issues. The changes described in Chapter 2 and the introduction of SEA, as a transitional measure can help to establish a more integrated policy framework. In the interim, however, project EIA must often deal with problems that stem from more systemic weaknesses of decision making.

- *Project cycle*: EIA tends to be poorly adapted to the realities of project planning and design, in general, and to feasibility and engineering studies that define proposals, in particular. Many commentators have noted this problem persists because of the reluctance of proponents to submit a project to EIA until it is clear that it will go forward (e.g., Ortolano and Sheppard, 1995). This limitation is correctable, in part, with the process control mechanisms (described in Chapter 3) that circumscribe proponents discretion, e.g., screening and other requirements that "trigger" the early application of EIA. Where these are in place, EIA and project development can be linked as generalized in Figure 5.1.

- *Operational integration*: Most EIA processes follow a similar pattern as described in Chapter 2. However, it is important to note that steps are iterative rather than linear. The operational integration of key steps means first, that each activity sets up and merges into the next. So, for example, the total EIA process from screening to decision making leads to progressively sharper impact definition. Of equal importance is the integration at each stage of technical analysis, public consultation, and process management, including coordination of roles and responsibilities.

Figure 5.1: Environmental Impact Assessment and Project Planning and Management



5.1.2 Dealing with Issues and Impacts

In the final analysis, the test of an EIA process is not an integrated flowchart but its application in practice. As a problem-solving exercise, the issues and impacts that EIA addresses are complex, controversial and cross-cutting, i.e., transcending both jurisdictional and disciplinary boundaries. The day-to-day practice of EIA usually involves meeting three fundamental challenges:

- uncertainty about side-effects and consequences of a proposed action;
- conflict of interests and values over the distribution of project costs and benefits; and
- fragmented policy mandates and institutional roles and responsibilities for managing these.

Strategies of response to deal with these challenges are identified below:

Apply best practicable science to the problem under investigation.

There is an exhaustive literature on EIA methodologies and their application. For a recent comprehensive review, see Canter (1995). Key points made in this and other comparable reviews include:

- no simple, "all-purpose" methodology is available;
- selection and use of appropriate EIA tools require professional judgment;
- their application, typically, must be "tailored to requirements" (e.g., to particular project-environment interactions); and
- in most cases, residual uncertainties will remain that require scientific (and community) interpretation.

Provide appropriate opportunities for public involvement to ensure, at a minimum, that the concerns and ideas of communities and groups who are affected by or interested in the project are taken into account.

There is a considerable literature on social impact assessment (SIA) and on public involvement, procedures and techniques (e.g., Roberts, 1995; Burdge and Vanclay, 1996). For present purposes, the key point is that there are three levels of public involvement that can be "fitted to purpose" in project EIA. This gradient comprises:

- consultation, e.g., hearing and meeting-type procedures that allow the public to respond and comment;
- participation, e.g., working groups and other interactive techniques that permit joint problem-solving; and
- mediation or other alternative forms of dispute resolution that facilitate consensus building and result in agreed solutions.

In all the above cases, special consideration may need to be given to minorities and other parties to enable their involvement in assessment and decision processes that affect their interests.

Make the EIA process issue-focused so that each proposal is examined at a level and in the detail appropriate to its potential for environmental change.

The EIA management for development agencies should be no more and no less than necessary. Other benefits, in terms of improved interagency cooperation and EIA performance, can be gained by imposing reasonable timelines for completion of more high profile, controversial issues. These should also be realistic however, recognizing that involving people takes time. As noted earlier, SIA is seen by its practitioners as a poor relation, and requires particular attention.

5.2 Scoping

Scoping is the foundation for effective EIA. It sets up an efficient process by identifying the right questions for which answers are needed for making decisions. There are certain differences in the way this term is used and applied internationally and not all countries have a formal scoping phase. Generally, however, scoping refers to an early and open process for determining:

- the information necessary for decision making;
- the important issues and concerns (interests);
- the significant effects, factors and alternatives to be considered; and
- the appropriate boundaries of an EA study.

Without exception, jurisdictions represented at the workshop were reported to encounter difficulties in "scoping to prioritize issues" and identifying the impacts of real concern to be analyzed in an EIA study and report. Based on screening or an equivalent process, which pre-identifies potential issues and impacts associated with a proposed activity, the range of concerns are progressively opened out during scoping, notably through public consultation. It is in narrowing these concerns down again -- "closing the scoping diamond" to delete inconsequential or peripheral matters -- where the difficulty occurs. Reaching agreement on what is significant at this stage is easier among EIA professionals than among all parties to the process. Often, there is a gap between the views of development proponents and those of the public affected by a proposal. The challenge is to maintain a dialogue with stakeholders without "bogging the process down".

When this happens, the following well-documented problems occur (Everitt, 1995):

- EIA impact statements become voluminous, detailed, and exhaustive documents with unnecessarily comprehensive data;
- significant or important issues are not identified during the EIA; in other cases, issues are identified late in the review resulting in costly revisions;
- irrelevant and insignificant issues are not eliminated, with consequent waste of time and money; and
- presentation of impacts and related environmental information often follows a sectoral, catalogue or inventory style approach.

Procedural aspects of scoping are shaped by the legal, policy and administrative requirements and guidelines in force in a particular jurisdiction. In the United States, for example, the Council on Environmental Quality (CEQ) (1981) has issued detailed scoping guidance, noting the importance of this process as "often the first contact between proponents of a proposal and the public". The CEQ's step-by-step advice on conducting scoping and recent case experience is described in Box 5.1. Other countries provide similar guidance.

Box 5.1 CEQ Step-by-Step Advice on Conducting Scoping

1. *Start scoping after you have enough information*, e.g., to present an initial list of environmental issues and alternatives.
2. *Prepare an information package*, e.g., sufficient for participants to make an intelligent contribution.
3. *Design the scoping process for each project*, e.g., relevant to the interests, views, and inputs on the issue at hand.
4. *Issue the public notice*, so as to best reach the affected public.
5. *Conduct a public meeting*, so as to keep discussions focused and productive.
6. *Review the comments*, with a view to selecting significant issues and impacts for study.
7. *Allocate work assignments and set schedules,* to complete the EIS in a timely, efficient fashion.
8. *Try a few ideas,* such as design workshops, review committees, and use of independent moderators in "hotly contested" cases.

Source: US Council on Environmental Quality, 1981, 3. A-5-3, A-13.

5.2.1 Objectives and Approach

Major goals of the scoping process include (CEQ, 1981):

- determining the scope of the EA study, i.e., what will be covered and in what detail;
- ensuring that real problems are identified early and that issues of minimal concern do not consume time and effort;
- preparing a draft EIS which is balanced and thorough;
- avoiding delays occasioned by redoing an inadequate draft EIS;
- fostering the development of an adequate and efficiently prepared EIS; and
- ensuring the affected public and agencies are involved from the outset.

Public involvement is an essential component of the scoping process as practiced in most leading countries. In US practice, for example, the following principles of scoping are important (CEQ, 1981):

- the process is open to the public, state and local governments, and affected federal agencies;
- it is more than simply an event or meeting and in particular, it is not a "public relations" requirement;
- depending on the circumstances, scoping can include a series of meetings, telephone conversations, and/or written comments from different interest groups; and

- it should be focused on identifying people who already have knowledge about a site, community plans and alternatives or other relevant information which the proponent may otherwise overlook.

5.2.2 Procedural and Technical Considerations

From a technical standpoint, scoping requires a *preliminary identification* of the affected environmental setting and potential impacts. Various methods are available for this purpose and are comprehensively described in the literature (e.g., Canter, 1995, 56-121). For *public scoping,* however, simple methods may suffice for describing, synthesizing, and communicating information on the pre-project environment and the potential impacts (e.g., using checklists, matrices, and networks). Depending on project scale and complexity, baseline studies or other inventories of the environmental setting will be undertaken. This component of EIA is frequently criticized as inadequate and flawed, e.g., superficial "one-off" surveys to identify key ecosystem components, habitats, and communities that deserve more intensive study and/or monitoring (Treweek, 1995). Further value can be added to this step by directing the baseline analysis to "environmental stock", i.e., using sustainability indicators, as recommended in UK guidance on development plan appraisal (UK Department of the Environment, 1993).

The Netherlands Commission for Environmental Impact Assessment (n.d.), for example, provides scoping advice to proponent agencies and its working groups, especially on the technical aspects to be covered, including "reasonable" alternatives to the proposed activity. In developing scoping advice, the Commission takes earlier advice on a comparable project as a point of departure, to ensure consistency. For first-time projects, the secretariat may base draft advice on the answers to a questionnaire presented to working group members and circulate this for detailed review. Dutch practice with respect to searching and selecting alternatives is particularly thorough (see Box 5.2).

"Objectives-led" or "decision-oriented" scoping is important to set appropriate terms of reference and to assist participating agencies, as well as the public, to focus on their key responsibilities and mandates. This exercise involves relating the proposal to development goals and policies and examining their implications for *environmental* objectives, strategies and plans. It will also help to identify and clarify reasonable alternatives to the proposal and indicate options for input at key stages of the design process (Brown and MacDonald, 1995). These decision contexts provide early "reference points" for structuring a study approach that can yield the right information at the right time.

5.2.3 Key Tasks and Activities

There are a range of practical considerations that need to be taken into account as part of effective scoping performance, i.e., that results in a closure on priority issues and establishes the basis for a focused decision-relevant assessment. A full consideration of these can be found in the companion paper by Canter and Clark (1996). For present purposes, the following are among the more important:

Box 5.2: The Approach of the Netherlands EIA Commission to Scoping

An EIS should deal with a restricted number of (environmentally) promising alternatives, whereas no relevant alternatives should be overlooked. The scoping process is used to identify these alternatives. Scoping can be seen as a "twin funnels" process of searching and selecting, in which the following steps are usually taken:

- describe beforehand clear objectives for the activity
- divide the activity into sub-activities, operations, measures or decisions
- search for possible variants for each of these sub-activities
- select interesting variants in relation to the criteria and expected environmental impacts
- cluster the variants into relevant alternatives

The following general criteria are commonly used to check alternatives:

- feasible in practice (sense of reality)
- meet the objective of the initiator, provided that this is not too narrowly defined (problem-solving capacity)
- sufficiently different (discriminating potential)
- cover the total range of possible solutions (width coverage)
- composed of "variants" that can be combined into a consistent entity (structure)

Source: Commission for Environmental Impact Assessment, 1994.

- describe the proposed action and its objectives (information package):
    - identify, inform and involve affected communities and other key parties;
    - establish community and scientific concerns;
    - evaluate these to determine key issues for the purpose of EIA; and
    - communicate the results of the process to participants.
- identify appropriate approaches to involving the target public, bearing in mind the pros and cons of positive versus more interactive consultation, e.g.:
    - standard public meetings;
    - open houses, hotlines, drop-in centres; and
    - workshops, citizen advisory committees.
- undertake interrelated tasks, including:
    - setting of geographic boundaries for the study;
    - determination of time period over which impacts will be predicted;
    - identification, classification, evaluation and prioritization of issues; and
    - preliminary identification of the major components of social, economic, and ecological systems that might be affected.
- ensure scoping results in four tangibles:
    - a targeted range of issues and impacts to be addressed in EIA;
    - a specification of the information and analysis required for the study;

- a clear, concise terms of reference for the EIA report; and where warranted; and
- an issue-based information system for storage, retrieval, and analysis of the information that is generated during the EIA.

In most jurisdictions, scoping is considered to be complete when the terms of reference or equivalent document is prepared. No scoping process, however well performed, is likely to cover all eventualities. As studies proceed, new issues and impacts may emerge, or ideas about the depth of analysis may change. Experience shows that some flexibility in the terms of reference is often necessary, to allow for variations to be made to the scope as the study proceeds, and as increased understanding of the environment and likely impacts develops. These provisions should be incorporated into negotiated agreements for process timelines and study schedules.

When properly applied, scoping helps to:

- allow the affected public to have their concerns taken into account at the outset;
- focus the EIA study on key impacts and alternatives;
- facilitate an efficient process;
- reduce the likelihood that the EIS will be different;
- ensure proponents do not waste time and money in collecting unnecessary information; and
- provide timely, usable information for decision making.

Box 5.3 summarizes sound principles for impact scoping based on discussions at the EIA Process Strengthening Workshop held in Canberra.

Box 5.3 Toward "Sound Practice" Principles for Impact Scoping

Requirements:

The determination of scope is made by the responsible or lead authority:

- in accordance with EIA laws, provisions and guidelines that apply in a jurisdiction
- consistent with characteristics of the proposed activity and the condition of the receiving environment
- taking into account the concerns of those affected by the proposal

Key Actions and Principles:

- pre-identify the possible range of issues and impacts associated with a proposed activity
- fix a "reasonable" time for public review and consultation (i.e. having regard to severity of issues)
- establish, as far as possible, the relative and aggregate significance of impacts, based on technical analysis and public concerns
- draft terms of reference to focus the EIA study on priorities
- begin, confirm or refocus baseline studies and/or monitoring as appropriate
- determine suitable methodologies and methods for next-phase impact analysis and public consultation
- recognize that this process also constitutes a re-scoping exercise, track accordingly and maintain flexibility
- prepare a scoping statement or report with brief updates as necessitated by changes

5.3 Evaluation of Impact Significance

Evaluating the significance of environmental effects is perhaps the most critical component of impact analysis. The interpretation of significance bears directly on project approvals and condition setting. At an early stage, it also enters into screening and scoping decisions on what level of assessment is required and which impacts and issues will be addressed. Subsequently, impact significance is a key to choosing among alternatives. In sum, the attribution of significance continues throughout the EIA process, from scoping to EIS review, in a gradually narrowing "cone of resolution" in which one stage sets up the next.

More than other components, however, the interpretation of significance is a contentious process. It occupies a "fluid boundary between science and politics" (Pritchard, 1993). This will be evident, for example, at the screening and scoping stages where value judgments and interpretations are made about whether and to what extent a proposal is environmentally significant. During the more detailed phase of impact analysis, determining whether impacts are significant and acceptable involves both prediction and estimation of nature, magnitude, timing, and duration, as well as the attribution of importance or value to these findings.

5.3.1 Modes of Evaluation

A considerable number of methodologies are available for determining impact significance on the basis of impact magnitude. These are widely reviewed in the literature as to their merits and limitations, ease of application and objectivity (e.g., Thompson, 1988). In practice, what invariably happens is some type of balance between expert, professional judgment, with or without aggregated scores and weightings, and level or expression of public concerns.

As far as possible, the impact analyst looks to determine the significance of predicted changes by reference to regulatory standards, objective criteria and similar "thresholds". Often, these are outlined in guidance. A three-question test is proposed by the CEAA (1995) to determine if "residual" environmental effects are adverse, significant, and likely (Box 5.4). Many, but not all, jurisdictions also follow the practice of formally evaluating significance of residual impacts, i.e., after predicting the nature and magnitude of impacts based on before- versus after-project comparisons, and identifying measures to mitigate these effects.

Note, however, that the accuracy of impact prediction has been found wanting in a number of critical respects (e.g., Buckley, 1989; Culhane, 1993), and uncertainty on this point compounds the task of evaluating significance. In the new Canadian EA system, public concern and social values are not factors in determining the significance of adverse impacts. The determination must be "objective, based on scientific and credible technical and other relevant information" and "reasonable so as to withstand court challenge". By comparison, under NEPA, public opinion and the level of controversy associated with a proposed action help to identify and determine significance. However, it is also recognized that public meetings do not necessarily attract a representative cross-section of values and that the lead agency for a proposal is ultimately responsible for judging significance.

Box 5.4 Significance Test Applied in Canada

Are the environmental effects adverse?

Criteria for determining if effects are "adverse" include:

- effects on biota health
- effects on rare or endangered species
- reductions in species diversity
- habitat loss
- transformation of natural landscapes
- effects on human health
- effects on current use of lands and resources for traditional purposes by aboriginal persons; and
- foreclosure of future resource use or production

Are the adverse environmental effects significant?

Criteria for determining "significance" include:

- magnitude
- geographic extent
- duration and frequency
- irreversibility, and
- ecological context

Are the significant adverse environmental effects likely?

Criteria for determining "likelihood" include:

- probability of occurrence, and
- scientific uncertainty

Source: Canadian Environmental Assessment Agency, 1995.

A discussion of practical issues of evaluating impact significance can be found in various sourcebooks (e.g., US Environmental Protection Agency, 1993). Examples range from specification of ambient threshold levels (e.g., for acceptable pollutant loadings) toward progressively more qualitative approaches, based on professional judgment of the ecological context and functional consequences of predicted loss and change (as in Box 5.4). In certain cases, risk assessment may be helpful for estimating the likelihood (or probability) that adverse ecological or health effects may occur. Social impact assessment has a rich array of tools helping to determine significance from a community perspective, but these do not appear to be drawn-on to the extent they could be in practice (see Finsterbusch and Gagnon, 1995).

A "two track" approach to evaluating significance can be followed, adjusted to the degree of uncertainty and controversy that characterizes a specific proposal, and to the changes in understanding that occur in moving from the early to the later phase of environmental assessment. The basic framework as proposed by Hilden (1996) and reviewed at the Canberra workshop is as follows:

- apply technical criteria when the likely changes associated with a proposal can be predicted with reasonable accuracy; and

- use a "negotiating" approach when factual information is limited and/or there is a high degree of uncertainty regarding potential impacts.

The latter approach, typically, will be associated with the early phases of assessment when activity-environment relationships are only generally understood and the proposal has a "variable geometry". Qualitative interpretations, drawing on a previous understanding of project characteristics and impacts and general environmental and sustainability principles, can establish a rational basis for further discussion, progressively drawing in a greater range of views on the likely significance of effects. As more information becomes available, e.g., from impact analysis, "technical methods" may increase in relative importance with judgments made against environmental standards and objectives, and against the use of specific criteria of the type outlined in Box 5.4. Further discussion of the application of this approach can be found in Hilden (1996).

5.3.2 Applications to Practice

The following points summarize case experience with evaluation of significance based on discussions at the Nordic and Australian workshops (Hilden, 1996; Hilden and Sadler, 1995; Sadler and Ashe, 1996).

- There are wide variations in general approaches to significance in participating countries; some have strong traditions in the use of quantitative technical criteria (such as Netherlands, Japan).

- Common problems relate to the multi-dimensionality of significance evaluation, i.e., requiring a blended, aggregate judgment, and to the "orthodox bias" of key actors, whereby disciplinary and professional perspectives frame evaluations of significance (and can make multidisciplinary consensus difficult to achieve).

- What works well? Four aspects stand out in this regard:

    - easy-to-use and explanatory criteria, e.g., health and safety standards;

    - basic criteria that allow for widely agreed comparisons, e.g., threats to rare and endangered species or protected areas as opposed to "loss of wetland functions" or ecological resilience;

    - approaches that help to structure and focus evaluation of significance, such as the tabular formats and cross-impact matrices; and

    - inclusion of operational "references" to project planning and policy design, i.e., what significance means to the proposal.

- By contrast, evaluating significance by reference to sustainability considerations (e.g., biodiversity), carrying capacity, cumulative effects, and other "big picture" concerns in which the claim of effects and consequences is attenuated, is more problematic and contentious. Given their increasing significance, this is an evident area for further work and clarification in guidance to assessors, proponents, and others.

- Good practice principles for determining impact significance are given in Box 5.5. Key requirements are to:
    - use a systematic approach in which the choice of method is clearly related to the problem at hand and, as far as possible, can be widely understood;
    - apply criteria that allow the attribution of significance in a rational, defensible and problem-relevant way;
    - identify the basis on which judgments are made;
    - distinguish between the ecological and social importance of impacts;
    - describe as necessary, the confidence levels in impact prediction and judgment that underlie the attribution of significance; and
    - provide a straightforward, non-technical explanation of approach (including assumptions and qualifications) when more complex methodologies are used, e.g., multi-criteria analysis.

- In the final analysis, recognize that the evaluation of significance is subjective, contingent upon values, and dependent upon the environmental and community context. Often scientists evaluate significance differently. The intrusion of wider public concerns and social values is inescapable and contentions will remain even with well-defined criteria and a structured approach.

Box 5.5 Toward "Sound Practice" Principles for Determining Significance

Requirements:

A statement on the likely significance of environmental impacts should form the basis for judging project acceptability and conditionalities. The evaluation of significance may be made following a four-step methodology of impact analysis to determine:

- the nature and extent of impacts (e.g., type, duration)
- likely adverse effects on the receiving environment (e.g., sensitive areas, land use, community traditions)
- magnitude of impacts (e.g., low, moderate, high)
- options for impact mitigation (e.g., reduction, avoidance)

Key Actions and Principles

- incorporate tests of significance at various stages of impact analysis
- make a concluding evaluation by reference to several questions:
    - how adverse are the predicted effects (e.g., change, loss, foreclosure)?
    - how do these vary in scope and intensity (e.g., in their effect on ecological and resource values)?
    - how significant or serious are the impacts (e.g., irreversible--> inconsequential)?
    - how probable is it that they will occur (e.g., high risk-->low risk)?

- note, in general, impacts are likely to be significant if they:
    - are extensive over space or time
    - are intensive in concentration or proportion to assimilative capacity
    - exceed environmental standards or thresholds
    - do not comply with environmental policies, land use plans, sustainability strategy
    - adversely and seriously affect ecologically sensitive areas
    - adversely and seriously affect heritage resources, other land uses, community lifestyle and/or indigenous peoples traditions and values

5.4 Review of EIA Quality

A review of an EIS or equivalent report takes place after its completion and before its submission to the responsible agency. This pre-decision review is an important "quality control" stage of the EIA process. It determines whether a report meets the terms of reference, examines required or reasonable alternatives, provides a satisfactory assessment of the environmental effects of the proposed activity, adequately deals with mitigation and, where necessary, follow-up, fairly represents public concerns and inputs, and provides the information required for decision making. With certain exceptions, the purpose of the review, which may range from a quick check to a systematic examination depending on the nature of the EIS, is to verify that the document is an adequate assessment and is sufficient for the purpose of decision making.

Usually, the review of EIA reports will commence once a report has been completed. However, it can begin earlier and be used as a monitoring tool to ensure that progress is satisfactory and that the terms of reference are being followed. Sometimes a review will identify further information that is required or further mitigation measures that could be included. In such cases, reviews must establish a set of quality criteria to be met and the minimum standards for achieving these. Performance standards and approaches vary by country and jurisdiction.

5.4.1 Institutional Arrangements

The institutional arrangements for EIA review include both formal and informal procedures for checking on EIS quality. In many countries, the review phase is an internal responsibility of the lead or proponent agency (e.g., UK). Other countries make explicit provisions for review by an environmental agency (e.g., Belgium-Flanders, Canada, Australia) or by an inter-agency technical group (e.g., USA). Several countries have also established mechanisms for independent, public review of EISs. These are of particular interest and include:

- permanent commissions (e.g., Netherlands and Italy); and
- review panels or inquiry bodies for certain major projects (e.g., Canada).

The process followed by the Dutch EIA Commission, which is of wide international interest, is described by Scholten (1996), in a companion report. In this system, the Commission receives and reviews all EISs prepared in the Netherlands. While recommendations are made with respect to information gaps and shortcomings, the Commission does not make judgments on the proposed acceptability and conditions setting. Similar arrangements are in place in Italy where the EIA Committee has wider responsibilities than the Dutch Commission. These include making judgments about the "environmental compatibility" of the proposal. Such judgments can be positive, leading to project approval conditional on recovering further information, or negative, leading to withdrawal of the proposal.

The use of EA review panels in Canada is an *ad hoc*, flagship process (about 50 panel reviews were completed in the period 1975-1995). A panel's major responsibility is to establish terms of reference for an EIS and to conduct a public review of its suitability. This involves determining whether an EIS is sufficient or deficient to go forward for public discussion and preparing a report, with recommendations, on project disposition. Principles and procedures for panel evaluation are described by Ross (1987) and their application to the most comprehensive federal review conducted to date was monitored by Sadler (1990). Independent panel reviews

are also used in New Zealand by the Parliamentary Commissioner on the Environment, who also exercises wider review powers and functions (see Boshier and McClymont, 1994).

5.4.2 Approaches to EIA Review

While the approach, methods, and criteria differ, formal EIS reviews focus on a number of common aspects. These include the "triple A-test" of "appropriateness" (coverage of key issues and impacts), "adequacy" (of impact analysis) and "actionability" (does the report provide the basis for informed decision making?). A more formal statement of review criteria might be:

- sufficiency of information provided (e.g., complete and conforms to study objectives);
- reliability of analysis or interpretation (e.g., consistent with state of scientific knowledge and methodology); and
- relevancy for decision making (e.g., clear description of environmental consequences and, where appropriate, management options).

Recently, there has been a growing interest in developing more systematic frameworks for EIS review. The Environmental Statement Review Package developed at the EIA Centre, University of Manchester, provides a basic, non-specialist framework for conducting EIS reviews (Lee and Colley, 1990). It comprises analytical criteria, directions on their application, and a so-called "collation sheet" for recording findings on key assessment tasks (e.g., baseline description, impact identification and evaluation, examination of alternatives and mitigation, and report communication). A seven-part rating scale is used. The review package has been widely used in the UK and several other countries (e.g., Ireland, Portugal) and the European Commission is developing a revised version.

Elsewhere, *ad hoc*, but possibly more customized criteria and methods are applied to EIS review. Often, these mirror the approach followed in impact assessment (e.g., use of matrices to check whether information is complete) and the points of view of all parties are fairly represented. Whatever approach is taken, the following steps have been identified as a good practice approach:

- set the boundaries;
- select reviewer(s);
- use input from public involvement; and
- identify review criteria.

5.4.3 Establishing Review Framework

This task can be done by answering the following set of questions (Scholten, 1996):

- *Are terms of reference available for the review, e.g., in the form of scoping guidelines?* If so, these establish a basis for judgment; if not, the first task of the review is to re-scope the main aspects of the project that should be addressed in the EIA report, e.g., using generic checklists.

- *Are existing reviews of EIA reports of comparable activities in similar settings available?* These provide useful reference material about the type of information that is necessary for decision making, e.g., regarding likely impacts.

- *What other review criteria should be included?* In addition to proposal-specific guidelines, other important factors can include:

    - legal EIA requirements (if any);
    - environmental standards or criteria about emission levels and environmental qualities directly related to the activity; and
    - the state of the development of technological and environmental sciences involved in the EIA report.

- *Finally, give special attention to the quality of the executive summary of the EIA report.* The summary must explain the significance of the impacts concisely and in a non-technical manner for decision-makers and other readers.

5.4.4 Conducting the Review

Depending on the scope, the review could involve three steps:

- *Step 1:* identify deficiencies in the EIA report using the reference materials identified above;
- *Step 2:* determine shortcomings that are crucial to restricting informed decision making, separate these from the less important deficiencies, and focus primarily on the former in the review; and
- *Step 3:* recommend to the responsible authority how and when any serious shortcomings should be remedied to assist decision making.

When an EIA report fails to meet the standards required, three remedial options are available depending on the nature and extent of the inadequacies.

- The shortcomings of the EIA report are so serious that they require immediate remedy in the form of a supplement to the EIA report.

- The shortcomings can be rectified fairly easily by means of a set of explanations and conditions attached to the decision.
- The shortcomings cannot be remedied immediately, either by providing additional information to the EIA, or in the form of explanations and conditions attached to the decision, because they require too much time and effort to collect. In this case, the review may recommend monitoring the shortcomings and uncertainties during the implementation and operation of the activity with possible corrective measures if impacts turn out to be worse than expected. A set of sound practice principles for review of EIA Quality based on discussion at the Canberra Workshop is outlined in Box 5.6.

Box 5.6 Sound Practice Principles for EIA Review

Requirements: A review of an EIA report prior to its submission in support of decision making is a critical means of "quality control". The preparatory steps below assume appropriate institutional arrangements for this purpose are in place:

Key actions and principles:

- setting the boundaries of the review based on
  - time available
  - funds available
  - established deadline
- selecting the team
  - in house staff versus outside experts
- discerning public concerns
  - use and consider participant suggestions; and
- identifying review criteria, e.g.,
  - are terms of reference available?
  - if not, cary out a quick scoping of the initiative,
  - are other EISs available for comparable activities?
  - if so, use them as points of reference,
  - if not, use general review criteria, such as
    - legal requirements
    - environmental values, standards
    - state of the art science and practice

Carry out a 4-step review to:

- identify all deficiencies
- determine how crucial these are for the decision
- indicate how to remedy crucial shortcomings, e.g.,
  - immediate action -- supplement to EIS
  - present additional information with decision
  - present additioanl informaiton during post-project analysis
  - present additional informaiton by review team; and
  - prepare a statement on adequacy/inadequacy of EIA

A fifty step is optional depending on the jurisdiction, namely:

- recommendation on the environment acceptability of a project
- go/no go
- terms and conditions
- best practicable environmental alternative

5.5 Monitoring and Follow-up

Recently, the post-approval phase of EIA has been given increasing attention (e.g., Economic Commission for Europe, 1990). In some countries, monitoring requirements for proposals subject to EIA are being strengthened through current or pending legislative and regulatory reforms (e.g., Canada, Australia). Elsewhere, agency guidelines and case precedents established by terms and conditions of project approval have served to promote monitoring practice (e.g., Netherlands, Hong Kong). The US Department of the Army (1988), for example, identifies five reasons for undertaking enforcement monitoring to ensure performance complies with an EIS and effectiveness monitoring to measure the success of mitigation (see Box 5.7).

Despite these advances, monitoring and EIA follow-up mechanisms remain poorly developed, especially by comparison to pre-decision activities. In large measure, this emphasis is an understandable reflection of the basic character of EIA as a predictive exercise that occurs in advance of project decision making. World-wide, however, the frequency with which follow-up is either absent or perfunctory amounts to a systemic weakness of the EIA process (see Court and Wright, 1994). Unless there is a minimum follow-up capability, EIA operates as a linear rather than iterative process and lacks continuity. Even worse, the process risks becoming a pro-forma exercise rather than a meaningful exercise in environmental management (Sadler, 1988).

Box 5.7 Enforcement and Effectiveness Monitoring -- Examples of US Conditions and Requirements

Five conditions determine the requirement for enforcement and effectiveness monitoring. If none of the these following conditions are met, then only an enforcement monitoring programme will be required.

- *Legal requirements* -- by law, certain actions require monitoring (e.g., dredge and fill permits from the Corps of Engineers).
- *Protected resources* -- monitoring is required for activities that affect federal or state-listed threatened species, historic sites, wilderness areas, wild and scenic rivers, and other public or private resources protected by law.
- *Major environmental controversy* -- monitoring must be undertaken for actions or mitigation measures that remain the subject of scientific disagreement or public concern.
- *Unknown mitigation outcome* -- the proponent must know if the measure taken was successful, as confirmed by expert opinion.
- *Changed conditions* -- alternatives to the environmental setting or to project activities will require preparation of a supplemental impact evaluation and additional monitoring.

Enforcement monitoring ensures that mitigation is being performed as described in the environment documents, that mitigation requirements are written into contracts, and that these provisions are enforced.

Effectiveness monitoring measures the success of the mitigation report and/or the environmental effect. This must be a scientifically based quantitative investigation.

Source: US Department of the Army, 1988.

5.5.1 Rationale and Objective

Limiting the EIA process to assessed as opposed to actual impacts, imposes a fundamental constraint on achieving its basic objective, namely environmental protection. All project decisions are made in the face of uncertainty, contingent upon the forecasts and predictions made in EIA. Yet all predictions of future events are inexact, at best, and uncertainty increases in relation to our lack of knowledge concerning project impacts and/or particular environmental systems. Lack of adequate monitoring and follow-up perpetuates this situation. As a result, there is a continuing risk of over- or under-estimating impacts, leading to either a misallocation of resources or greater, environmental damages than were bargained for. When impacts are larger than forecasted, additional corrective actions need to be taken; for example, intensifying impact mitigation measures (where feasible), renegotiating compensation arrangements or rehabilitating resource stocks (for case examples and discussion, see Sadler, 1987).

The objectives of the follow-up of the EIA process are to:

- ensure terms and conditions of project approval are implemented;
- verify environmental compliance and performance;
- cope with unanticipated changes and circumstances;
- adjust mitigation and management plans accordingly; and
- learn from and disseminate experience with a view to improving the EIA process and project planning and development.

5.5.2 Elements of Approach

Like other stages of EIA, of course, follow-up activities need to be targeted and tailored to issues. Where necessary, a comprehensive approach to follow-up will encompass four main components (Sadler, 1988):

- *surveillance* and inspection to ensure terms and conditions are being followed in project construction;
- *monitoring* to check for compliance with standards to test the effectiveness of mitigation and other protective measures, and to detect potentially damaging changes (e.g., above as-predicted levels);
- *management* to respond to unforeseen events or to offset larger-than-predicted effects (e.g., by employing contingency plans or revising environmental management plans); and
- *auditing/evaluation* to review aspects of EIA practice and performance and to provide feedback for process improvement (e.g., mitigation measures, administrative procedures).

The above activities serve both *control* and *learning* purposes. Surveillance and compliance monitoring (which is often qualitative) provide information that is immediately applicable to regulatory and environmental management. Effects (or impact) monitoring requires scientific measurement (e.g., water quality constituents and trace contaminants in aquatic food chains downstream of a wastewater treatment plant). This type of information facilitates management (e.g., indicating whether more stringent controls are required) and establishes the basis for improved understanding of cause-effect relationships (providing certain conditions are met).

Based on monitoring and other data, audits of the accuracy of impact prediction and other evaluations of whether and how the EIA process achieved its objectives can be undertaken (see Bisset and Tomlinson, 1988; Sadler, 1988; Buckley, 1989; Culhane, 1993). These are essentially feedback rather than control mechanisms to transfer knowledge to future activities, and are relevant to more general frameworks for EIA effectiveness and performance review, as described in Chapter 3.

Post-project analysis is a term frequently used to describe a comprehensive assessment of the implementation of activities once approval has been given to proceed with a proposal. With this addition, EIA covers the life cycle of a project (e.g., planning, design, construction, operation and decommissioning). The controversy over the disposal of the Brent Spar structure demonstrates the importance of this "total approach", especially for large scale, hazardous facilities. In such cases, monitoring and other follow-up activities should be built-in from the outset, beginning with baseline or reference conditions to allow pre- versus post-operational (impact) comparisons to be made. Where this has not happened, and there are grounds for concern that merit follow-up, the impact-backward approach can be used as described in Folio 3.7.

Guidelines for post-project analysis and monitoring have been issued by Environment Canada (Davies and Sadler, 1990). However, it should be stressed that these are experimental and are still to be tested. Additional measures are proposed in the paper by Au and Sanvicens (1996) to integrate impact management and other control functions.

5.5.3 Determining the Need for Follow-up

EIA follow-up requirements are expensive and require appropriate targeting and prioritization. In this regard, the following sound practice pointers may be helpful (Au and Sanvicens 1996):

- Project surveillance and auditing for compliance with conditions of approval should be regarded as bare-minimum requirements in any situation. Other follow-up requirements should be determined on an as needed basis.
- Scoping of the follow-up monitoring and management requirements preferably should be undertaken as an integral part of the EIA process. A decision on the follow-up requirements should be made at the same time as project approval and incorporated into terms and conditions.
- Key criteria in determining the need for follow-up requirements are:

    - the extent of uncertainty in the analysis and predictions of the EIA;
    - the extent of unfamiliarity with the mitigation measures;
    - the complexity of the predicted environmental impacts; and
    - the risk if controls are not properly implemented.

- Experience to date indicates that scoping of follow-up requirements is not a common practice and is characterized by problems, e.g., difficulty of securing agreement on what needs to be or can be monitored or followed up.

5.5.4 Effects Monitoring and Impact Management

Baseline and effects monitoring provide an essential basis for both ongoing impact management during the implementation phase and during the audit and verification of EIA performance. In brief:

- baseline monitoring refers to systematic, repetitive measurement of environmental parameters beginning in the pre-project phase to determine their natural variation;
- effects monitoring describes the measurements taken during project implementation with a view to detecting activity-related changes; and
- compliance monitoring takes the form of periodic sampling or outcomes measurement to ensure emissions conform with regulatory requirements (Davies and Sadler, 1990; Au and Sanvicens, 1996).

The design of an effective monitoring programme involves a range of considerations, including:

- defining scope and aspects of coverage (e.g., water, air, terrestrial systems);
- establishing objectives and data requirements to meet them;
- setting boundaries and comparison sites for observation and sampling;
- selecting key indicators to be measured; and
- deciding how the data gathered will be interpreted and applied, e.g., with regard to immediate feedback to environmental management and to future improvements to EIA process and project planning, and draft monitoring protocols so that all parties are aware of requirements and responsibilities.

A scientifically rigorous monitoring programme will provide time-series data which can be tested for statistical significance of variations. This type of programme, which needs specialized advice and direction, will be required for verification of predicted impacts. In other cases, and where there are cost constraints, other less demanding types of follow-up countries or mechanisms may be able to yield quick results at a level sufficient for impact management and oversight. In the Hong Kong case study (Folio 5.3), various instruments and measures are used to track implementation measures and provide feedback.

5.5.5 Monitoring and Environmental Performance

Because the monitoring programme will usually correspond to the objectives of an environmental management plan, the data compiled can contribute to reporting on environmental performance. In some countries, there is now added emphasis on requirements for proponents to assume responsibility for monitoring and reporting. The regulatory agency will usually undertake check-monitoring and periodic audits to ensure companies are in compliance with license conditions and are meeting regulatory standards. For this process to work effectively, a pre-determined contingency response plan needs to be in place to meet situations where inspection and surveillance results confirm major problems.

Effects monitoring also provides the basis for EIA auditing to:

- determine the actual impacts and outcomes of projects and developments that have been subject to an EIA;
- gain a better understanding of impacts that are not well understood;
- verify the nature and accuracy of impact predictions, and further understanding of capabilities in this area; and
- identify the success of mitigation measures and management plans.

Although making these interpretations is not easy, the information provided by follow-up, monitoring, and management will significantly strengthen the quality control and feedback functions in the EIA process. General guidance on sound practice is given in Box 5.8.

Box 5.8 "Sound Practice" Principles for Follow-up

Premise:

Follow-up activities on a scale consistent with the estimated significance of project impacts should be undertaken to ensure compliance with approvals, and to facilitate environment management and performance review.

Requirements:

These include appropriate legislation, regulations and/or administrate provisions and mechanisms to provide for inspection, enforcement of terms and conditions, monitoring and control of unanticipated impacts.

Follow up Actions and Principles:

Major functions and activities include:

- *inspection and surveillance* to check that terms and conditions are met
- *effects monitoring* to measure environmental changes resulting from project implementation
- *compliance management* to ensure that regulatory standards and requirements are being met
- *impact management* to respond to adverse changes and environmental performance audit to verify effectiveness of EIA, mitigation and other components

Inspection and surveillance should be undertaken as either a routine or periodic activity depending on project terms and conditions.

Monitoring, audit and other follow-up activities should be undertaken when:

- potential effects are uncertain or unknown but likely significant
- species or areas of concern act as a trigger
- changes can be realistically detected against natural variability

5.6 KEY POINTS: SUMMING UP THIS CHAPTER

Scoping is the foundation of the EIA process. It is an interactive process that should:

- incorporate the concerns and views of affected communities and interested parties;
- define the boundaries of EIA assessment;
- clarify the key issues, impacts and alternatives to be considered;
- outline the approach to be taken in addressing them;
- identify procedures for public involvement; and
- establish terms of reference for ongoing assessment, including timelines, schedules, and requirements for input to decision making.

Evaluation of significance is a decision-shaping area of EIA practice. It involves making value judgments about the importance of predicted impacts that bear directly on project acceptability and conditionalities. Useful points regarding good practice include:

- use of systematic approach, e.g., organized to the "two track" framework for evaluating significance;
- apply clearly defined criteria to evaluate significance;
- document the reasons for interpretations -- this is particularly critical when broadly-based considerations, such as biodiversity, are important;
- describe, as necessary, the confidence levels for impact judgments; and
- provide a non-technical explanation if complex methods are used (e.g., for aggregation and weighting).

Review of EIA reports is a key pre-decision quality control stage of the EIA process. The purpose of EIA review is to consider if the report is an adequate assessment and sufficient for decision-making purposes. The review:

- addresses the terms of reference;
- examines alternatives, impact, mitigation and monitoring;
- uses appropriate scientific and technical methodology;
- includes the views of all parties and represents them fairly;
- describes findings and results in an understandable manner; and
- provides information that is sufficient and relevant to decision making.

Key steps in review of an EIA report include:

- setting the boundaries;
- selecting reviewer(s);
- identifying review criteria;
- conducting the review;
- determining any shortcomings and deficiencies; and
- documenting remedial options.

Follow-up -- monitoring, management and auditing-- is necessary to build a post-decision quality control function into the EIA process. Its scope and comprehensiveness, like that of pre-decision assessment, will depend on the potential significance of the impacts and the uncertainties about prediction and outcomes. Depending on the approach warranted, follow-up requirements may include:

- inspection and surveillance to ensure terms and conditions are implemented;
- compliance or effects monitoring to respectively ensure standards are met and impacts are within "as predicted" levels;
- impact management to address unanticipated changes and adjust mitigation measures and environmental management plans accordingly; and
- audit and process evaluation measures to examine the accuracy of predictions, the success of mitigation measures, and overall levels of environmental and EIA performance.

Folio 5.1:
Addressing Cumulative Effects - the Example of the Coastal Zone Inquiry, Resource Assessment Commission, Australia

Background: The Resource Assessment Commission (1989-1993) was established to provide independent policy advice to government on natural resource management issues. Under Section 7 of the *Resource Assessment Commission Act* (1989), it is required to take an integrated approach and to have regard to efficiency, ecological integrity and equity considerations. During its tenure, the Commission undertook a number of public inquiries within a multidisciplinary, strategic framework of assessment.

Analysis: The Coastal Zone Inquiry was based on a "broad-brush" assessment of cumulative effects, i.e., linking patterns of growth to region-wide environmental change. Urban sprawl and tourism development are identified as the principal causes of stress on marine, estuarine and terrestrial ecosystems, e.g., pollution loadings, shell fish contamination, habitat depletion and deterioration, and agriculture land alienation. Strip development is almost uninterrupted in some coastal regions (e.g., Northern New South Wales - Southern Queensland). The Commission made the telling point that decisions and commitments made already will ensure that non-metropolitan urban sprawl and its consequences likely will continue for another decade. A process of "regulatory rubber-stamping" of individual developments (unobjectionable in themselves) with no overview of the larger environmental consequences lies at the heart of the problem. The coastal zone is a jurisdictional tangle of overlapping spheres of government and divided sectoral responsibilities, where signals often conflict. The Commission concluded that a national approach is required, based on common goals and principles that are implemented locally.

Lessons: The Inquiry recommended a National Coastal Action Programme that emphasizes three elements which are critical to addressing cumulative effects:

- adopting a long-term, holistic perspective (over short-term expediency);
- greater community and industry involvement in decision making; and
- use of innovative tools and measures to assist integrated Coastal Zone management, (e.g., economic instruments to fully implement the user-pays principle, strengthening the integrity and reliability of the EIA process).

Source: Resource Assessment Commission, 1993.

Folio 5.2:
From Project EIA to Comprehensive Regional Assessment -- the Lancaster Sound Panel Review, Canada

Background: Under the federal Environmental Assessment system, a formal (public) review by an independent panel is required for major proposals with potentially significant environmental impacts. Lancaster Sound was one of a series of EA reviews of major energy developments proposals undertaken in Northern Canada in the late 1970s.

Analysis: In 1978, Northlands Petroleum proposed drilling a single oil and gas exploration well, offshore in Lancaster Sound (at approximately 74^0N, 81^0W). The proposal was referred for panel review by the initiating agency, with a request for regional clearance for drilling in other locations. Lancaster Sound, the eastern entry to the Northwest Passage, is a unique marine ecosystem, with an unusually high concentrations of arctic wildlife, on which the local Inuit traditionally depend. It is also a physical environment dominated by ice, with a short summer season for deep-water drilling. These concerns led the panel to an interim conclusion that "a meaningful assessment of exploration drilling in Lancaster Sound cannot be made in isolation from the broader issues" -- which require a "relative assessment and comparison of ... policy options". In its final report, the panel recommended: i) a deferral of drilling "until such time as the government has addressed the issue of the best use(s) of Lancaster Sound"; and ii) any future request for regional clearance supported by a comprehensive regional assessment". Subsequently, the Canadian Government initiated the Lancaster Sound Regional Study, a two-year comprehensive public review of the future of the area that identified the basis for a new policy and planning regime.

Lessons: The Lancaster Sound review:

- underlined the importance of a coherent policy-planning context for project-by-project EIA;
- resulted in comprehensive regional assessment as part of policy making and planning for optimum resource use(s); and
- emphasized the importance of taking account of the concerns of indigenous peoples.

Source: Report of the Environmental Assessment Panel Lancaster Sound Drilling. Ottawa: Federal Environmental Assessment Review Office, 1979.

Folio 5.3:
EIA Follow-Up Monitoring and Management in Hong Kong

Background: In Hong Kong, much attention is now being given to the follow-up monitoring and management after approvals are given on the basis of an EIA. Starting in the 1990s, a systematic, comprehensive environmental monitoring and audit system has been developed, initially for the Airport Core Programme Project worth US$20.3 billion, and subsequently for other major projects in the territory. The system was put in place out of a necessity to reduce the gap between the promises made by proponents during EIA and performance during implementation. Some of the lessons and experiences gained may be applicable to other jurisdictions.

Hong Kong has adopted a three-tiered criteria system of environmental quality performance limits, with an event action plan set out in the environmental monitoring and audit manual. The first stage is a trigger level, to provide an early warning. The second stage is an action level, where action is to be taken before the upper limit is reached. This upper limit is the third stage or target level. Once the monitoring results go beyond these limits, a predetermined event-action plan is initiated to avoid or rectify the problems.

Lessons: The experience to date in Hong Kong indicates approaches and mechanisms that work to strengthen the follow-up process include:

- making the monitoring and audit requirements part of the project decision making;
- regular reporting by the proponents on their performance;
- the requirements on the part of proponents to produce and agree with the EPD, the monitoring and audit protocols and event-action plans;
- proactive approach to activity monitoring and impact management;
- proper training for those who have to carry out follow-up monitoring and management, letting them understand the basis of the EIA recommendations and the action plans required; and
- independent surveillance and vetting of monitoring results.

EIA follow-up activities that need to be further strengthened in Hong Kong are those related to post-project audit because of the lack of experience, data, and practical tools. In the absence of EIA legislation, difficulties in enforcement have been encountered.

Source: Au and Sanvicens, 1996.

Folio 5.4:
EA and Design of Cost-Effective Alternative: Fundy Trail Parkway, New Brunswick Canada

Background: In 1991, the Fundy Trail Development Authority Inc. (FTDAI), a non-profit crown corporation, proposed a Cdn $45 million, 75 Km parkway for an undeveloped segment of coastline to be constructed in four phases. It submitted a project registration as required by New Brunswick's Environmental Impact Assessment Regulation (87-83) under the *Clean Environment Act*. Subsequently the proponent was required to conduct a full environmental impact assessment.

Analysis: The EIA was comprehensive in its technical, environmental, and economic analysis, but it focused on the parkway development only. Various interest groups argued for an alternative, less intrusive development that would focus on ecotourism, with a hiking rather than an automobile focus to yield economic benefits. The alternative gathered support during the EIA public consultation activities and when public hearings were held. The hearing panel concluded that a scaled-down, phased implementation was appropriate for Phase I. Other conditions recommended by the panel were to require separate assessments for subsequent phases. The government accepted the panel's recommendation with some revisions. As approved, the project provides for improved road access to the coast but with a strong ecotourism approach (e.g., hiking paths, lookouts, camping).

As a result of the EA process, a balance was struck between environment and economic values. The EIA work was very cost effective. The direct cost of the studies was $570,000 or 1.3% of the estimated cost of the parkway project. The consultative EIA process resulted in an acceptable project at a capital cost estimated at $10 million compared to the original concept estimated to cost $45 million. These savings were made possible by a review process that drew out and examined alternative economic development approaches. In the process, important valued natural features and resources of the Fundy coast were secured, including rare plant communities, sensitive coastline, viewscapes, and other heritage values. Environmental protection was essential to achieving ecotourism potentials. An Environmental Management Plan ensured maintenance and protection of these features and resources, with conflicts between forestry and ecotourism avoided through buffer zones.

Lessons: Several lessons are apparent:

- The EA process added substantial value, based on detailed local knowledge for a scaled down intensity of development.
- The economic benefits of the revised project were proportionately much greater than those of the original proposal.
- Cooperation between various government departments were key to a harmonized assessment, review, and decision-making process.
- An environmental plan incorporated a comprehensive set of conditions on project approval.

Source: Doyle *et al*, 1996.

Folio 5.5:
Québec Mediation, Inquiry, and Hearings Process, Canada

Background: Established in 1978, the Bureau d'audiences publiques sur l'environnement (BAPE) in Québec, is a quasi-judicial, advisory body with a strong record of public participation. Its role is to inquire into any question relating to the quality of the environment submitted to it by the Minister of the Environment and report back on its findings. Typically, BAPE reviews major projects subject to provincial EA legislation for which any person, group or municipality can request the Minister to hold a public hearing. Depending on the nature and scope of the issues, BAPE will be instructed to use one of three options for project review: hold a fact-finding inquiry, alone; carry out a combined inquiry and mediation; or undertake public hearings.

The Process: In the case of inquiry and mediation, a BAPE Commissioner meets individually and collectively with the parties involved to seek a joint solution. If they reach agreement, the parties must write to withdraw their request for a hearing. This formalizes the agreement and BAPE submits its report to the Minister. However, if the parties refuse to participate in mediation, if agreement cannot be reached, or if the Minister believes that the agreement does not protect the environment and the public interest, then the matter will be subjected to a public hearing. In these cases, BAPE serves as an independent review board, comprising 2 to 5 Commissioners, depending on the complexity of the project.

Québec legislation sets out clear timelines for key activities. The public has 45 days to review the EIS for a project, and, if warranted, request mediation or a hearing. BAPE must report to the Minister within 120 days of receiving a request for a public hearing, or within 60 days of receiving a request for an inquiry or inquiry with mediation. The report must be made public by the Minister within 60 days of receipt. However, the Minister has the discretion to extend the 120-day time period for complex projects or policy reviews which affect the entire province.

In the Québec process, clearly-defined timelines are widely recognized as the key ingredient of an efficient EA and hearings process. They are particularly important to proponents, bringing certainty and structure to the EA process, avoiding undue delays and costs, and facilitating implementation of approved projects. Process efficiency and timeliness are also seen as maintaining the overall credibility of EA as an effective part of environmental planning and decision making in Québec.

Since 1978, BAPE has used mediation to resolve 28 cases, with an overall success rate of 75%. In 1993, new administrative and public mediation procedures were developed to streamline the mediation process. The 60-day timeline provides an incentive-focused negotiation avoiding the protracted process which can sometimes occur. In this regard, the option for referral to public hearings helps circumvent the perception of negotiating under threat of closure. Québec experience confirms that mediation is a cost-effective approach to certain kinds of project assessment, reducing time and costs of the process while allowing the parties involved to devise a solution that will be acceptable to the community, and politically acceptable to the Minister.

Lessons: The BAPE experience highlights several important lessons:

- public involvement and transparency of process (whether for mediation or hearings) is a critical element of long-term credibility and success of EA in decision making;
- explicit timelines are an important contributory factor; and
- mediation provides an effective and efficient means of resolving conflict.

Source: Doyle et al, 1996.

FOLIO 5.6:
Socio-Economic Impact Assessment, Northern Cheyenne Tribal Council, Montana, USA

Background: During the 1970's, large-scale energy development proposals were targeted on Indian reservations and ancestral lands in the American West. The Northern Cheyenne of Southeastern Montana successfully challenged outstanding coal leases and permits on its reservation, arguing that more time was needed to examine the consequences of the proposed development. An underlying concern was that the NEPA-mandated social impact assessments (SIA)s of energy- related developments were narrowly conducted. The Northern Cheyenne Research Project (NCRP) was established to provide an independent source of information and analysis with the community and its development as the main reference point.

Analysis: A basic objective of the NCRP was to collect reliable information on the population. The study included:

- threshold surveys, e.g., of attitudes, education, employment, income, housing, mobility;
- a tribal consensus of all on- and off-reservation Northern Cheyenne;
- a survey of privately-owned business operating on and around the reservation; and
- a study of public agencies delivery services to the reservation, including the number and type of jobs for Cheyenne employees.

Initially, the studies provided the Northern Cheyenne with a systematic body of evidence on which to intervene in six or seven EIAs of energy development taking place in the vicinity of the reservation. Based on interventions, the US Environmental Protection Agency granted the tribe a Class 1 (clear) air-quality status. This meant, in effect, that Montana Power Company were denied a permit to construct two additional power plants, 15 miles north of the reservation.

Additionally, the socio-economic assessment provided a systematic baseline profile of tribal members' perceptions and attitudes to economic development on or near the reservation.

Lessons: The Northern Cheyenne SIA:

- established an on-reservation data, research, planning, and intervention capabilities;
- assisted the tribe in positioning the community with respect to possible development; and
- demonstrated also that such approaches themselves are not immune to weaknesses of technical SIAs as recognized by the tribe.

Source: Davis, 1988

CHAPTER 6:
STRATEGIC ENVIRONMENTAL ASSESSMENT--
EXPERIENCE, STATUS AND DIRECTIONS
FOR IMPROVED EFFECTIVENESS

This chapter reviews the emerging use of strategic EA (SEA) in several countries and international organizations, based on a review of ten major processes and 40 case studies. It provides an overview of the status of the field, key trends in scope of application, use of methods and procedures, and relevance of SEA for policy making.

6.1 INTRODUCTION

Recent progress with the application of EA to policies, plans, and programmes is the focus of much current interest and investigation (see Box 6.1). This approach, usually called strategic EA or SEA, is acknowledged as a promising avenue for incorporating environmental considerations into the highest levels of development decision making. However, SEA systems and processes are still at a relatively early, formative stage of development. Many practical issues with respect to institutional frameworks, procedures, and methods have yet to be resolved. These concerns have guided the information gathered and the analysis undertaken in the effectiveness study.

This chapter provides an overview of the status of SEA and directions for improved effectiveness. It is based primarily on background and supplementary reports prepared under the leadership of the Netherlands Ministry of Environment in cooperation with the Dutch EIA Commission (Sadler and Verheem, 1996). These materials, in turn, incorporate a range of inputs from other effectiveness study workshops and conference sessions, which culminated in the Hague workshops on international progress in SEA and selected national experience with its policy level application. Held in conjunction, the two workshops brought together SEA experts from some twenty countries and international organizations with particular experience in this area. Many of the points made here were developed from that exchange of views and information.

This examination of SEA is organized into five parts:

- initial perspectives on the field;
- SEA systems and institutional frameworks;
- issues and lessons regarding the quality of SEA practice;
- conclusions and recommendations on process development; and
- case studies of recent experience.

Box 6.1 The "3Ps" -- A Glossary of Terms

The following definitions are generic and meant to have sufficient flexibility to encompass terminology used in different countries:

1. **Policy**: a general course of action or proposed overall direction that a government is, or will be, pursuing and which guides ongoing decision making
2. **Plan**: a purposeful, forward-looking strategy or design, often with coordinated priorities, options, and measures, that elaborates and implements policy
3. **Programme**: a coherent, organized agenda or schedule of commitments, proposals instruments, and/or activities that elaborates and implements policy

The 3Ps may have a national (government-wide), sectoral or spatial focus, and are used in a sequential, interchangeable or hybrid manner.

6.2 Initial Perspectives on the Field

The canvass of views on SEA conducted through the effectiveness study provided an initial perspective of the field as seen by practitioners and administrators. Box 6.2 summarizes the common responses. Most notably, the case for SEA is widely accepted and a high priority is placed on further development of this process. Despite this general recognition, there are a range of particular concerns and issues that require further scrutiny. These include questions of clarification regarding the what, why, and how of SEA. Such questions, in turn, reflect apparent reservations about the way the field is sometimes interpreted and positioned in the critical literature.

Box 6.2 Perspectives on SEA

(not necessarily ranked in order of importance)

- the case for SEA appears widely accepted among EIA professionals
- its introduction and implementation has a high priority
- various models of approaches to SEA are promoted in the literature
- there is a danger of overselling SEA, especially as a "clone of EIA"
- basic terms and concepts are still open to interpretation
- overall "blanket definition" of SEA masks important differences in policy-making processes
- participants at the "EA Summit" took a conservative view of the role and potential of SEA
- there are different views regarding the appropriate scope and form of SEA
- no consensus regarding its application to policy, as compared to plan and programme levels
- decision makers and development proponents are skeptical of the value of SEA
- crucial need is to demonstrate the uses and benefits of the process
- SEA practice still incompletely known and possibly misunderstood in the literature
- major requirement is for "hands on" case studies

Source: Effectiveness Study Workshops.

At this stage, a flexible and pragmatic perspective on SEA is endorsed. This is briefly elaborated here with reference to four basic questions:

- *What is SEA*? The term describes a systematic process of addressing the environmental considerations and consequences of proposed policy, plan, and programme initiatives. SEA is a decision-aiding process that can be and should be applied flexibly to the decision cycle, recognizing that these terms mean different things and often cover different types of decision-making processes. In all cases, the approach taken should be consistent with EIA principles. What does not automatically follow from this definition is the requirement to use EIA procedures and methods in SEA, though their use and adaptation for this purpose is widespread.

- *Why is SEA important?* The purpose of SEA is to integrate environmental and sustainability factors into the mainstream of development policy making as called for by the Brundtland Commission and Agenda 21. A wider rationale for the use of SEA is to (see also Box 6.3):

    - incorporate sustainability considerations by addressing the cause of environmental problems at their policy source, rather than just treating the symptoms or impacts;
    - serve as an early warning mechanism to identify cumulative effects recognizing these are best dealt with regionally or pragmatically rather than on a project-by-project basis; and
    - focus and streamline project EIAs making them more consequential by ensuring prior questions of need, justification and alternatives are subject to environmental scrutiny at the appropriate policy, plan and/or programme level.

Box 6.3 Rationale for SEA

There are several reasons why SEA of policies, plans and programmes is a necessary and important aid to informed decision making:

- building environmental considerations into all levels of development decision making, not just project approvals
- helping to determine need and feasibility of government initiatives and proposals
- avoiding the foreclosure of options and opportunities which arise when assessment occurs only at the project stage
- addressing environmental issues and impacts that are best dealt with or can only be considered at the policy or programme level (e.g., initiatives that are not divisible into projects)
- establishing an appropriate context for project EIA, including the pre-identification of issues and impacts that warrant detailed examination

- *How is SEA related to decision making?* The scope and form of SEA will be contingent upon the function assigned, the policy and institutional frameworks that are in force, and the extent to which other comparable processes and instruments are used or available for similar purposes. Depending on these arrangements, SEA can be used to either operate as a part of an integrated process or a separate approach and incorporate other factors (e.g., social, health) or focus only on biophysical ones. At an operational level, SEAs will vary with several factors including:

    - the level and generality of decision making (e.g., broad policies versus specific plans);
    - the policy sector covered (e.g., energy and transportation are known to cause environmental concerns); and
    - the type of environmental consequences that can be anticipated, notably whether likely effects are direct or indirect, discrete or with spatial linkages.

- *When and where are EIA procedures and methods appropriate?* The main steps and activities in the EIA process are widely recognized as establishing the generic basis for a systematic approach. In practice, however, specific EIA procedures and methods will need various degrees of modification. The appropriateness of these techniques can be broadly correlated with the degree to which cause-effect relationships can be determined. Key questions in this regard are:

    - whether or not a policy, plan or programme will initiate, locate or lead to projects and activities; and
    - extent to which the direct and indirect impacts and risks associated with these are able to be identified. The response to this question points toward the use of impact assessment or policy appraisal modes of approach.

The introductory points and guides above are made primarily to clarify the frame of reference within which subsequent trends and issues of SEA practice are reviewed. National reviews have been used to document the record of practice of partner and collaborating agencies, consistent with the comments outlined in Box 6.2.

6.3 SEA Systems

The adoption and use of SEA varies both geographically and jurisdictionally, with regard to the levels and sectors of decision making covered. As yet, only a few countries and international agencies have established SEA systems, i.e., in which process and practice is formally organized. However, others are introducing provisions for SEA or are investigating the feasibility of doing so. On a larger front, there is a growing recognition of the importance of increasing and broadening the use of SEA.

In comparison with project EIA, national and international agency systems for SEA are less clearly delineated and not as well understood. In this section, an overview is given of recent developments in ten jurisdictions where SEA process and practice are relatively well advanced.

The review covers four main aspects relevant to the status and effectiveness of SEA internationally:

- short profiles of the operational regimes and experience in selected countries and agencies;
- comparative analysis of the institutional arrangements that are in force;
- evaluation of trends in practice; and
- taking stock of the relevance of SEA for policy making and planning.

6.3.1 Country and Organizational Profiles

Based on the stage of development and experience gained, SEA systems, world-wide, can be divided into three categories:

- *relatively advanced* -- with a formal, systematic process or equivalent approach (e.g., North America and Australia);
- *moderate provision and/or elements* -- SEA-type approaches established as part of EIA and/or planning processes (e.g., various industrial and developing countries); and
- *little or no capacity* -- EIA and planning systems are at a rudimentary stage because of resource and institutional constraints (e.g., poorer developing countries).

Many countries and international organizations can be located only approximately in this general classification. Some, for example, will not fit readily into one or other of the categories. In addition, SEA provisions, processes and practices will vary considerably within each category. The relatively advanced systems described below explicitly apply SEA to review policies, plans and programmes. Although the coverage is limited and incomplete with respect to practice elsewhere, the institutional frameworks and procedures illustrate a mix of approaches that are of wider interest in the light of the consideration now being given by other countries and international organizations to introducing SEA or equivalent processes.

Australia:

No specific provisions for SEA are currently in place at the Commonwealth (national) level following the closure of the Resource Assessment Commission. However, a SEA option is under consideration as part of a public review of the EIA system, with a view to strengthening it in support of the objectives and principles of Ecologically Sustainable Development (Commonwealth Environment Protection Agency, 1994). At the state level, New South Wales and Victoria have established coordinated project EIA and land use planning systems which incorporate SEA elements, and Western Australia has explicit provision for EA of policies, plans, and programmes. Experience to date in Western Australia has largely been at the plan and programme level, and, in general, results are reported to be positive. Policy-level assessment has been limited to specific cases (largely in the resource/environmental, urban, and industrial sectors) and reinforces the notion that application of EIA principles, rather than

the process, is of greater importance. There is no standardized procedure. Depending on the circumstances, a combination of statutory and informal mechanisms are used for (or as an alternative to) policy EA, including the use of project EIA and SEA of plans and programmes to retroactively influence policy (Sippe, 1994b).

Canada:

The federal government established a process of policy and programme assessment under the Cabinet directive of 1990. Canadian provinces do not have comparable systems, although some have elements of SEA (e.g., Ontario has used its class assessment process to review development plans and programmes). At the federal level, all agencies submitting policy and programme proposals for Cabinet decision are required to assess and document their potential environmental effects. The so-called "blue book", drafted by the Federal Environmental Assessment Review Office (FEARO, 1993), outlines basic requirements and responsibilities, including those for public disclosure and reporting. It is estimated in the "blue book" that 75% of Cabinet business will not require an EA. However, to date, no figures are available on the number of environmental statements and supporting analyses attached to Cabinet submissions. A recent spot-check of process implementation found a mixed record, with examples of good practice but inconsistent overall compliance. Many agencies are reportedly not sufficiently aware of or do not commit resources to policy and programme EA (LeBlanc and Fischer, 1994). Guidance on good practice in policy and programme assessment is currently under development by an interdepartmental committee.

Denmark:

The 1993 Administrative Order of the Prime Minister's Office (amended 1995), requires assessment of all bills and other government proposals presented to Parliament that are expected to have a significant impact on the environment. Few procedural elements are identified in the Order. However, advisory guidelines and a case book of examples of practical applications to policy EA have been issued by the Department of Environment. In practice, process and procedure have evolved incrementally. Results from the first year of practice indicate that 25% of bills and proposals submitted to Parliament had an environmental statement attached and one-half of these were identified as having an impact. The initial batch of SEAs were reported to be of "variable" scope and quality -- with environmental bills and proposals being most comprehensively reviewed (Johansen, 1994). In the future, improvements are looked for in this area and in overall compliance. As well, the wider use of SEA is expected, e.g., for regional development plans where agriculture, conservation, and recreation options often conflict (Elling, 1995).

Hong Kong:

The application of EA to policy proposals is based on a 1992 directive by the Governor, (the Hong Kong Government is executive led). All policy papers and proposals submitted to the Executive and Legislative Councils must contain an environmental implications section (EIS). The department initiating a proposal is responsible for preparing the EIS; the Environmental Protection Department provides "pre-clearance" advice. Initial experience with this process is

generally considered positive, notably in gaining an early identification of environmental issues. However, findings at this stage tend to be vague and generalized; in part, because there is an ad-hoc approach to SEA screening and reviewing. This is identified as an area for future attention. Currently, a more systematic SEA process is being applied to help formulate the territorial Development Strategy -- which forms the apex of the planning hierarchy in Hong Kong and serves as a framework for coordination of policy, programmes and sub-regional and local plans (Law, 1994; see also Au, 1994).

European Commission (EC):

A proposal to adopt an SEA directive was contained in the 1995 legislative programme. Within member states, there are an increasing number of SEA-type processes. These differ widely in their mandate, coverage of policies, plans and programmes, and degree of compliance with accepted principles and requirements (Lee and Hughes, 1995). A brief update on SEA trends in member states of European Countries not reviewed individually here is given in Box 6.4.

Within the Commission, itself, internal provision and basic procedures for EA of new legislative proposals and actions were established in 1993. The main steps are:

- screening of the legislative programme to identify proposals likely to require assessment (the green star designation); and
- scoping, assessing and reporting by the responsible directorate of initiatives with potentially significant effects.

Process initiation has included Commission-wide training and the establishment of environmental accountability mechanisms within the directorates. Following initial experience with a flexible approach, requirements for a more comprehensive process of guidance and monitoring by the environmental directorate are foreseen (Norris, 1994).

Box 6.4 Update on SEA Trends in Six European Countries

1. **Austria**: A study on SEA has been commissioned and its results will form the basis of further discussion of measures for process implementation.[1]
2. **Belgium**: In Flanders, the Brocken Commission for the Revision of Environmental Law has proposed framework legislation which includes both EIA and SEA.[2]
3. **Finland**: The EIA Act requires SEA for certain plans, programmes and policies and the Finnish Environment Agency is undertaking research on process development.[3]
4. **France:** A limited form of SEA was introduced by the Ministry of Environment Decree of 1993 that EIA must assess the programme to which a project is linked.[4]
5. **Germany**: "Strategic EIA" is undertaken in the context of regional and local land use planning; and is obligatory for actions that will be the basis for listed projects under the EIA Act.[5]
6. **Ireland**: Elements of an SEA approach are evident in certain national/regional plans and programmes that refer to particular projects and locations (e.g., transport sector).[6]

Sources: 1. Waltraud Perek; 2. Paul Scheurs and Dimitri Devuyst; 3. Mikael Hilden; 4. Max Falque; 5. Dieter Wagner; 6. Brian Meehan. *EIA Newsletter* 10, 1995.

The Netherlands:

Under the EIA Decree (1987), SEA is required for certain sectoral policies, national and regional plans and programmes that fix the location of projects for which an EIA is mandatory. At this level, the provisions and process for SEA and project-EIA are identical and a tiered system operates for specified planning sectors (e.g., electricity generation, waste disposal). Many early SEAs were overly complex and had marginal influence on decision making; recent experience, as monitored by the Dutch EIA Commission, is more positive (Verheem,1992, 1994).

Since 1995, an environmental paragraph, or E-test, is applied to all policy initiatives that require Cabinet decision and are not now subject to EIA as described above. The E-test is a flexible instrument with a minimum of procedural and content provisions in line with the objective of introducing it in a low-key, pragmatic manner (de Vries, 1994). Other recent developments include the application of SEA to selected overseas aid programmes of the Dutch Ministry of Foreign Affairs. In combination, these additions provide relatively comprehensive coverage of decision-making levels and policy sectors.

New Zealand:

The Resource Management Act (1991) consolidates policy planning, assessment, and regulatory functions previously exercised separately. It provides a comprehensive framework with a single purpose of promoting "the sustainable management of natural and physical resources" (Section 5). A hierarchy of national and regional policy statements and regional and district plans form the cornerstone for implementing the Act. SEA is intended to be an integral part of policy and plan-setting, rather than being applied to them as a separate procedure. The resulting framework, in turn, establishes a context and parameters for subsidiary EIAs, which are required for all resource use consents and where the presumption is for protection via rigorous limits on discharges etc. However, in practice, implementation of the Act is occurring slowly. Experience to date indicates that local governments still rely on project EIA rather than undertaking policy and plan-level assessments. (Dixon, 1994; Gow, 1994).

United Kingdom:

Environmental appraisal of policies and plans is the non-mandatory British equivalent of SEA. No formal provisions or standardized procedure are prescribed; instead, the Department of the Environment (1991, 1993) has issued "good practice" guidance for environmental appraisal of policies formulated by central government and statutory development plans prepared by local governments.

Policy appraisal incorporates the framework of cost-benefit analysis; plan evaluation follows a three-step approach to record environmental stock, scope the relevant issues, and apply a policy impact matrix. Despite criticisms of their discretionary nature, UK guidelines, especially for plan evaluation, have a clear sustainability orientation. Overall, however, policy appraisal is not yet as systematically and consistently practiced by government departments as it should be (Department of the Environment, 1994). Guidance with respect to development plans is more

recent, but several local authorities are reported to have undertaken thorough and effective environmental appraisals and others are now following their lead (Zetter, 1994).

United States:

The *National Environmental Policy Act* (NEPA 1969) applies to "legislation and other major Federal actions." As interpreted by the Council on Environmental Quality (CEQ), this refers to policies, plans and programmes. In practice, only programme environmental impact statements (PEISs) are a relatively well established feature of NEPA. PEISs typically focus on activities that are related sectorally, regionally, generically by stage of technology development or otherwise connected (e.g., by reference to potential cumulative effects). It is estimated that several hundred PEISs have been completed in the resource management, waste disposal and other sectors. Recently, PEISs have gained currency as a means of facilitating long-range planning, of dealing with cumulative effects, of tiering actions requiring project EIA, and, under prodding from court rulings, of evading costly litigation (Webb and Sigal, 1992; Sigal and Webb, 1994). So far, NEPA provisions have yet to be applied to broad government policies. With certain exceptions, such as California (Bass, 1990), SEA is not well developed in state EIA systems.

The World Bank:

Under Operational Directive 4.01 (1991), provision is made for project-specific, regional, and sectoral EAs. Sectoral EAs are used at the programme-level for reviewing investment alternatives, proposed policy changes, institutional requirements, and the cumulative effects of several, interrelated capital projects or a number of smaller, similar investments. Regional EAs are applied where a number of development activities, with potentially significant cumulative effects, are proposed for a reasonably well defined natural system or administrative area. World Bank experience with sectoral EA is reported to be greater than with regional EA, and it is furthest advanced with respect to application to energy, transportation, and agricultural investments. Both processes are acknowledged as having important benefits, including reducing the time and effort required for subsidiary project EIAs, and facilitating the early identification of issues and impacts associated with development options (World Bank 1991). Less clear is whether sectoral EAs influence the selection of environmental alternatives and whether regional EAs ensure that development options are environmentally sustainable (see Goodland and Tillman, 1995).

6.3.2 Institutional Frameworks and Procedures

With one exception, the basic questions regarding the enabling conditions for sound practice are the same for EIA and SEA. However, in the case of SEA, there is a prior, fundamental concern about its feasibility and acceptability given the considerable skepticism of and resistance to the approach often found among development agencies. The pre-requisites for SEA thus become an additional factor for consideration, one which qualifies the institutional arrangements and process developments that are possible.

Pre-requisites for SEA

The feasibility of SEA can be determined by reference to the following points and questions:

- Whether and under what circumstances SEA can be introduced depends on the societal support base and the political culture -- the customary laws, rules, and norms that guide decision making and acceptance of institutional innovations (see Box 6.5). The absence of political will precludes the introduction of SEA and bureaucratic resistance slows or side-tracks its implementation as national experience above indicates (see O'Riordan and Sewell, 1981).

- How SEA may be applied, once basic constraints are cleared, will depend partly upon the type of policy and processes that are in place. This approach is most easily accommodated in a well structured, hierarchical framework; however, policy making is often a fluid and complex process in which the range of choice is gradually narrowed by a series of unrelated decisions (see Bregha, *et al.*, 1990).

- What realistically can be done in these circumstances is best determined by taking a flexible, adaptive approach to adding environmental value to decision making. As a first step, institutional auditing and "mapping" can help to identify the constraints and opportunities that apply in a particular jurisdiction and help customize a strategy, including requirements for institutional capacity building and training.

Box 6.5 Some Institutional Barriers to Introducing and Implementing SEA

- *Insufficient political will* -- as indicated by low priority given to environmental concerns, by closed processes of decision making, and by low levels of accountability
- *Limited societal support base* -as indicated by low degrees of activism and of political influence by public and community groups
- *Narrow definition of issues* -- reflected in prevailing emphasis on economic growth and failure to consider strategic environmental implications
- *Compartmentalized organizational structures* -- typically, consideration of environmental matters is curtailed by the sectoral division of political powers and agency responsibilities
- *Bureaucratic prerogatives* -- environmental requirements encroach on the "turf and territory" of other sectors which is zealously guarded by officials, especially at the policy level

Source: O'Riordan and Sewell, 1981; Bregha, *et al.*, 1990; discussion at the 6th Australia-Canada-New Zealand Tripartite Workshop on EIA, Wellington, 1991.

Types of SEA Provision

With reference to the systems reviewed, three types of provisions for SEA can be distinguished:

- legislative or mandatory requirement (e.g., USA, Western Australia);
- administrative order or Cabinet directive which may be classified as "quasi-mandatory" (e.g., Canada, Denmark, Hong Kong); and
- advisory guidelines or operational policies which, in practice, may be interpreted as discretionary or "binding" (e.g., UK, European Commission, World Bank).

EIA or equivalent legislation provides the basis for SEA in several countries, notably where the primary focus is on plans and programmes. This provision is exemplified by the US NEPA system, where PEIS requirements include case law precedent, as well as by CEQ regulations on process application. Other countries, specifically those that have established policy-level EA processes, have opted for an administratively-based system. In the Netherlands, for example, an explicit distinction is made between the "E-test" of policy, which is based on Cabinet order, and statutory requirement for SEA of specified plans and programmes under the EIA Decree (1987). A similar lower-key approach, consistent with the recognition of policy making realities, has guided the administrative provisions established earlier by Canada, Denmark, and Hong Kong and also underpin the guidelines laid down by the UK and the European Commission. Other implications, discussed below, follow from these provisions.

Process Models and Elements

In broad outline, the SEA systems reviewed earlier exhibit three structural forms. These can be described as:

- *standard (EIA-based) model* -- SEA of policies, plans, and/or programmes is patterned after the EIA process with similar steps and activities but with differences introduced by more fluid policy requirements (as in Denmark);
- *equivalent (environmental appraisal)* model -- policy and plan evaluations, are undertaken to identify and take account of environmental effects (as in the UK); and
- *integrated (environmental management) model* -- SEA is undertaken as an integral part of a comprehensive policy and plan setting process (as in New Zealand).

The above approaches are overlapping and variously represented in different countries. Elements of process are or can be combined as required and thus cut across to some degree the provisions reported above. For example, the EIA-based model is reportedly most successful when applied to plans and programmes that initiate or resemble the rational, technical process of project decision making. However, the generic steps and activities are applied to policy, bills, and similar proposals.

In practice, the scope, detail, and interrelationship of the generic steps in SEA, vary considerably. EIA-based process steps must be modified for application to take account of the greater level of generality and uncertainty encountered in policy and plan-level appraisal, though their essential characteristics are still recognizable. For example, screening is widely

relied on to trigger SEA and the EIS is scaled to policy application in the paragraph and supporting documentation that accompanies Cabinet memoranda or parliamentary submissions. As experience increases, more customized SEA processes, with steps and elements tailored to the different configurations of policy and plan-making, can be expected. New Zealand's attempt to integrate EA into all levels of policy and plan-setting probably represents the most ambitious step in that direction but still remains to be fully implemented.

Both procedural guides are reflected and elaborated by recent lessons of practice. These indicate the importance of:

- carefully screening for the most effective stage(s) at which to apply SEA;
- determining where, when, and how to involve the public, or outside parties;
- ensuring that confidentiality is a legitimate reason (not an excuse) for excluding them;
- as far as possible, keeping SEA procedures short and simple;
- providing the right information at the right time;
- acknowledging that assessment is one step in a continuous process;
- monitoring or tracking a policy, plan or programme to (re)assess unforeseen modifications; and
- bringing in new information and options as required.

6.3.3 Guiding Principles

In general, the countries with policy-level EA systems have taken a pragmatic, flexible approach to their introduction. Some of the directives followed include:

- keep it simple to start (Denmark);
- the initial purchase on policy setting is the biggest gain (Hong Kong);
- least procedure as possible, consistent with compliance (Netherlands);
- allow for discretion and flexibility of approach (Canada, European Commission); and
- exploit the opportunities in project/EIA to influence policy and initiate SEA (Western Australia).

Guiding principles of SEA process application are outlined in Box 6.6. These reflect those developed earlier but with modifications from the guidelines in force in the countries and international organizations reviewed. The focus of guidance differs from country to country. The Western Australian approach is particularly comprehensive (see Sippe, 1994b). Key principles of EIA relevant to the policy level are grouped into two categories: class 1 comprises basic principles which correspond to those listed in Box 6.6; class 2 refers to desirable principles and to specific steps and procedural requirements, e.g., for scoping, independent evaluation, and timetables for assessment[4].

[4] The principles adopted by Western Australia are based on the National Approach to EIA negotiated by the states and Commonwealth government (Australian and New Zealand Environment and Conservation Council 1991). A similar approach for Victoria has been suggested by Saunders (1991).

Box 6.6 Guiding Principles of SEA

The following principles appear to be widely supported:

- initiating agencies are accountable for assessing the environmental effects of new or amended policies, plans and programmes
- the assessment process should be applied as early as feasible in proposal design
- scope of assessment to be commensurate with the proposal's potential impact or consequence for the environment
- objectives and terms of reference should be clearly defined
- alternatives to, as well as the environmental effects of, a proposal should be considered
- other factors, including socio-economic considerations, to be included as necessary and appropriate;
- evaluation of significance and determination of acceptability to be made against policy framework of environmental objectives and standards
- provision should be made for public involvement, consistent with potential degree of concern and controversy of proposal
- public reporting of assessment and decisions (unless explicit, stated limitations on confidentiality are given)
- inclusion of environmental factors in policy making
- tier processes, where possible, to subsidiary SEA and project EIA
- monitoring and follow-up of measures, including tracking proposals that initiate further actions
- need for independent oversight of process implementation, agency compliance, and government-wide performance.

6.3.4 Oversight and Administration

In all cases, the responsibility for undertaking SEA rests with the initiating agency. Minor exceptions are the preliminary screening of annual legislative programmes by the environment agency in the Danish and European Commission systems. However, these activities do not change existing decision-making powers. The controls established as part of SEA systems, encompassing legal, regulatory, and administrative review, differently circumscribe and influence the competencies of development agencies. Again, the main distinctions in this regard are between administratively-based, policy-level SEA processes and those founded on EIA laws and regulations. The latter, not surprisingly, providing for more stringent direction and control.

Based on these comparisons, several points on process administration of policy-level SEA can be made:

- procedural guidance emphasizes principles and allows for considerable flexibility in approach by proponent agencies;
- in this context, "case books of good practice" are an important tool for promoting consistency and quality of assessment (UK with a discretionary process has emphasized this approach);

- measures for accountability, monitoring performance, and verifying compliance are limited and lack judicial or independent review mechanisms found in EIA-based systems; and
- looking ahead, process administration probably needs to become more proactive, beginning by establishing clear ground rules and guidance necessary to maintain public confidence in process integrity and to improve practice and performance.

6.4 Trends in Process Application

The test of institutional arrangements for SEA lies in their implementation. A look at trends in SEA practice was undertaken by reference to approximately 40 case studies in addition to the institutional profiles reported above. Four considerations are particularly relevant to SEA effectiveness:

- scope of process application;
- opportunities for public involvement;
- integration of SEA with project EIA and other instruments; and
- relevance and value for policy making.

6.4.1 Scope of Application

From the countries and cases reviewed, the following patterns of activity stand out:

- *Policy, plan and programme focus:* Examples can be found of SEAs carried out for all levels of decision making. These include EAs of broad national policy and legislative proposals. Not unexpectedly, however, the majority of formal SEAs are for sectoral plans and programmes and regional development and land use plans;

- *Sectors and areas covered:* At this level, SEA seems to be applied most often to three key development sectors: energy, transport, and waste management. Natural resource management issues (e.g., water, forestry, agriculture and wildlife) are moderately well represented in SEA practice. Other sectors such as tourism, housing, and settlement appear to be subject to SEA through their inclusion in regional development and land use plans rather than targeted directly;

- *Range of factors included*: Most SEAs reviewed adopted a relatively broad definition of environmental considerations to include socio-economic, health, and other relevant factors. However, cumulative effects are not always addressed sufficiently; which is surprising in light of the rationale for SEA. There were few evident examples of integrative assessment, i.e., identification of environmental, social and economic considerations, trade-offs and policy options. The Lake Burullus case and the Australian Forest and Timber Inquiry both demonstrate such an approach (Folios 6.6, 6.7); and

- *Timing of assessment:* Many of the examples cited in the folios were reportedly applied in accordance with the principle of early application of the SEA process, as an integral part of policy, plan or programme design including the evaluation of alternatives. Because of political or decision-making circumstances, other cases were applied at a later or even post-decision stage. Although this is less than ideal, it still may be useful in guiding the implementation of policy; for example, Canada's environmental review of the North American Free Trade Agreement was applied in parallel with negotiations and is widely credited with "greening" them and leading to the establishment of an important environmental side-agreement (see Folio 6.8).

6.4.2 Public Involvement

Some degree of public involvement occurred in many of the cases reviewed but was absent or unclear in others. Often, involvement appears to take the form of information provision or selective consultation with non-government organizations. This is notably the case with respect to SEA of policies and bills largely reflecting the requirements of Parliamentary and Cabinet submission. In this case, documentation and disclosure become important. Canadian provisions make particular reference to these requirements and to the importance of a public statement on how environmental considerations have been incorporated into decision making (see Box 6.7).

Overall, more widespread forms of public participation occur in SEA of development plans and programmes, especially where these influence the siting of specific projects and facilities likely to arouse controversy and interest. An exception is the public inquiry of national policy issues; for example, extensive use was made in the Australian Forest and Timber Inquiry of hearings, community surveys, extended consultation and dispute analysis (see Folio 6.7). Netherlands, US and Western Australian practice, amongst others, demonstrate the use and benefits of public input at the plan and programme level. In the Netherlands, for example, public consultation on those plans that require an SEA under the EIA Act occurs at two stages of the process: in scoping and in reviewing the quality of the report. Usually, inputs are solicited via written comments or through public hearings. Dutch case studies show that this form of public consultation creates little or no delay in the planning process. Equally important, it brings valuable information into the SEA and increases the credibility of the plan finally accepted. These lessons of good practice can guide adaptations at the policy level (see Box 6.8).

Box 6.7 Guidelines on Reporting
Canadian Federal Process of Policy and Programme Assessment

Documentation and Disclosure

For environmentally relevant initiatives being considered by Cabinet, including the Treasury Board:

- a statement on environmental implications should be included in Memoranda to Cabinet, and where appropriate, in Treasury Board Submissions and other documents submitted for consideration by ministers; and
- where anticipated environmental effects are likely to be significant, a more detailed account of the environmental assessment and the rationale for the conclusions and recommendations should be included in the documents supporting the proposal.

Any disclosure of information will be subject to existing legislation, regulations and policies governing the release of information.

Public Statements

- Minister will determine the content and extent of the public statement according to the public interest and the particular circumstances of each case, where a statement is required
- The purpose of the public statement is to demonstrate that environmental factors have been integrated into the decision-making process, not to necessarily provide a detailed account of the assessment work undertaken

For initiatives likely to have significant effects, it is suggested that the announcement contain:

- a summary of the anticipated beneficial and/or adverse environmental effects of the initiative and their expected significance; and
- where relevant, information on the measures adopted to mitigate adverse environmental effects, and on the follow-up programme to monitor the initiative's effects over the longer term.

Source: Federal Environmental Assessment Review Office, 1993, 6-7.

Box 6.8 Balancing Consistency and Flexibility in Public Involvement in Policy SEA

- Public involvement should be an integral part of the SEA process; it ensures procedural integrity and provides relevant information and input to decision making.
- A degree of flexibility will be necessary in applying widely agreed principles of public involvement to policy making, because of the diverse, often open-ended nature of the process(es).
- Some aspects of development policy making may require little more than public scrutiny of the process; others will lend themselves to widespread participation; and in certain situations, it may be appropriate to involve selected NGOs, e.g., for policies, plans, or programmes where the environmental effects are indirect or uncertain, or when the general public may be less interested.
- The form of public involvement selected should be consistent with the nature and scope of the issues generated by the policy, plan or programme and reflect the interests and values affected.

6.4.3 Integration of SEA with Project EIA

In principle, SEA and EIA can and should be tiered or vertically integrated. This is widely recommended as a logical approach to focus and streamline SEA and EIA (e.g., Sadler, 1986; Wood and Djeddour 1992). When established, tiering facilitates addressing environmental considerations at the appropriate level(s) of development decision making and with the degree of effort necessary for informed choice. In practice, however, varying degrees of integration are possible.

Specifically, tiering is easiest and most successful where SEA is applied to policies, plans, and programmes that initiate or fix projects. In the US, for example, project EISs are routinely tiered to prior-order PEISs. For specified sectors (e.g., energy and waste management), the Netherlands has developed a highly integrated planning and assessment system (see Box 6.9). By contrast, in countries with policy-level assessment systems, preliminary evidence suggests these are difficult to tier to project EIA (e.g., Canada) either because there are no evident linkages or because these are unclear, pending other decisions and developments. The *New Zealand Resource Management Act* (1991), perhaps the most integrated framework to date, prescribes a clear, tiered relationship of policy, planning, and project-level EIA, but it is yet to be fully implemented.

Box 6.9 Example of Tiered Assessment -- Waste Management in the Netherlands

National level:
- decision(s) on technologies for final waste treatment, e.g., reuse, dumping or incineration and total treatment capacities; and
- SEA carried out to identify available options and assess their impacts.

Regional level:
- decision(s) on where treatment sites will be located; and
- SEA assesses location options and their environmental consequence.

Project level:
- decisions on design and mitigation measures for each of the selected locations;
- project EIAs are tiered to earlier assessments and decisions; and
- as such, they are specific, limited and to-the-point.

6.4.4 Relevance for Policy Making

The impact of SEA on policy making is open to interpretation, not least because experience is still at a relatively formative stage. At the Cabinet level, in particular, it is not always clear whether or not policy decisions are informed or guided by SEA. Despite these and other ambiguities, some general observations and insights can be drawn from the activities and examples found in the SEA systems profiled here. The following points were aided by discussion with administrators and practitioners who attended the Hague SEA workshops.

- *Policy leverage*: At a basic level, the very provision for SEA provides a "purchase" on the environmental consequences of policies, plans and programmes. By definition, it requires development proponents to think about and take account of the environment. In SEA systems that are structured to executive decision making, a degree of (minimum) influence is reflected by the percentage of proposals to Cabinet, Parliament or other form of executive government that are subject to SEA and contain a statement of impact or of no-significance (e.g., 25% of bills/proposals in Denmark; 50% of policy papers in Hong Kong). However, it is not clear how many proposals with potentially significant environmental effects escape SEA. This is identified as an area for improvement (e.g., in Denmark and Canada).

- *Acceptance and influence*: Not unexpectedly, most SEA systems appear to have a mixed track record in terms of informing and influencing policy making. Because policy making is a more fluid process than project approval, SEAs can be overtaken by political events and circumstances. For better defined SEA processes for plans and programmes, there appears to be routine acceptance and use by decision makers of the information provided (e.g., Netherlands and the USA).

- *Test case experience*: With few exceptions, the case studies listed in this report resulted in environmental factors being incorporated into policy, plan, and programme proposals. This is a litmus test of SEA performance. Although test case experience cannot be generalized, it does demonstrate the feasibility and utility of SEA for decision making. In some cases, the benefits of the process were officially or informally acknowledged by initiating agencies and/or development proponents (e.g., Sichuan Gas Development Plan, China/World Bank. In other cases, the benefits were evident in the results achieved (e.g., Canadian environmental review of NAFTA).

- *Ingredients of success*: The ingredients of relevance for policy making correspond to the principles of EIA/SEA drawn up previously. Where the SEA process is well founded, based on the application of all or most of the principles listed, the greater appears to be the likelihood of its relevance to decision making. This represents a critical area for further work and comparisons.

- *Cost effectiveness*: The time taken to complete the SEAs reviewed here ranges from a few days (e.g., for preparation of environmental statements in Cabinet or parliamentary documents) to five years (for the PEIS of Environmental Restoration and Waste Management, US, in Folio 6.5). However, the latter case is unique. On average, comprehensive SEAs of sectoral development plans and programmes take about six months (e.g., in the Netherlands). Case examples and workshop discussions indicate that this can be reduced, perhaps significantly, as proponents and practitioners gain experience, and with further adaptation of methods and procedures as discussed next (see DHV Environment and Infrastructure, 1994).

  Except for the World Bank (1995), detailed information on costs is not readily available. At the Bank, sectoral EAs are comparatively inexpensive (average cost US $100,000) compared to Category B project EIAs (average cost US $200,000 to $300,000 or roughly 0.1% of total project cost). These figures largely reflect international professional

consultancy fees (but do not appear to factor in overhead and other costs). In the public policy sector, the percentage of overall costs for many SEAs will not be evident because there is no end capital investment. The completion of SEAs undoubtedly adds to time and cost of overall planning. However, the consensus among practitioners is that this is reasonable in the light of the benefits derived.

6.5 SEA Methodology and Practice

SEA is a relatively new emerging area of practice, and the methodology is still evolving. This is recognized as especially the case with respect to certain types and theaters of policy, from which the outputs are general and the effects and consequences are difficult to identify and trace. At the same time, case experience also indicates that a range of tools and techniques are applied in support of SEA at all levels of decision making. In this section, the concern is to briefly: take stock of the SEA tool kit, indicate the range of applications, and link procedural and methodological aspects of "good practice". A seven-part, step-by-step framework is used to structure the discussion and highlight potential application to ongoing work.

6.5.1 The SEA Tool Kit

The SEA tool kit is drawn from both project EIA and policy and plan appraisal. A brief catalogue of methods and techniques that are applied or potentially available is given in Folios 6.13 and 6.14). These are drawn from two complementary sources:

- Canadian (draft) sourcebook on policy and programme assessment (FEARO, 1992); and
- European commission review of existing SEA mechanisms with particular reference to proposals (plans and programmes) that direct or initiate projects (DHV Environment and Infrastructure 1994).

In Folios 6.13 and 6.14, a distinction is made between methods for impact *identification* and methods for impact *analysis*. This is intended to facilitate selection of tools and techniques in relation to the different levels of generality encountered in SEA. For example, impact analysis methods can be expected to generally apply for plans and programmes that initiate projects and where environmental effects are expected to be significant and quantifiable or tangible. Most of the impact analysis tools and all of the impact identification methods listed can be used with the in-house expertise available to most government agencies. Some may require more specialized expertise; examples include multi-criteria analysis and life cycle analysis.

6.5.2 Generic Steps and Activities

As in project EIA, the basic steps in SEA form part of an iterative, adaptive process of policy, plan, and/or programme review. In many applications, only some of the stages outlined below will need to be undertaken. When undertaken together, these would form part of a full scale or comprehensive SEA. The approach is generic and encompasses policy, plan, and programme applications followed by different jurisdictions.

Screening to Initiate SEA

Most countries use a checklist or equivalent device to identify whether a proposal is likely to have potential environmental effects and to establish the level of examination that is required. Danish guidelines, for example, calls for the use of a screening/scoping checklist to make a quick assessment of whether or not a government bill or proposal is likely to have significant environmental impacts or require possible alteration. Other countries, where SEA is applied primarily to plans and programmes, may apply a more extended screening or public scoping process to test for significance (e.g., Western Australia, USA). In cases where screening/scoping procedures are not required (or not enforced), difficulties are reported in initiating or subsequently applying SEA (e.g., Hong Kong). Elsewhere, key process benefits could be secured by explicit considerations of tiering options, striking a balance between the issues that are to be dealt with now compared to those that can be more effectively dealt with as a later stage.

Objectives-led Scoping

In scoping, an important distinction is whether the process is applied on an informal basis or as a formal, public activity as in the USA and Netherlands. At this level, scoping can be an extended step; for example, the US Department of Energy held 23 public meetings over a two-month period, following a Notice of Intent to prepare a PEIS of the long term strategy for Environmental Restoration and Waste Management. These helped lay the basis for a complex, five-year process of technical analysis of risks, impacts and alternatives (see Folio 6.5). The latter approach is characteristic of EIA-based processes applied to specified plans and programmes.

Most countries do not prescribe a scoping "methodology". An exception is the UK good practice guide on development plan appraisal (Department of the Environment, 1993). Scoping is the second stage of a three part process comprising: i) defining environmental stock to establish the baseline against which policy options and plan proposals are to be evaluated; ii) defining appropriate scope of the plan; and iii) checking actual against appropriate scope using a policy impact matrix. This approach, according to Zetter (1994), puts the environment at the centre of plan making, identifies the issues that require particular attention, sets standards and targets for use in the plan, and draws attention to policy alternatives. It also facilitates an "objectives-led" approach (Raymond, 1995) to assessing sectoral plans and strategies, using environmental goals and targets as reference points for identifying effects and clarifying possible trade-offs and conflicts.

Evaluation and Comparison of Alternatives

Establishing options to proposals subject to SEA is a critical element in facilitating informed choice. Often, alternatives tend to be limited in scope in order to focus evaluation and decision

making. Some of the case studies with a strong technical focus have used optimization techniques to group a subset of objectives. In other cases, an extended set of alternatives were used for either impact comparison to facilitate choice; e.g.:

- the SEA of the European High Speed Train network (Folio 6.3) compared relative environmental gains of alternative transport modes; and

- the Australian Forest and Timber Inquiry (Folio 6.7) identified five options or management scenarios, from maximizing wood production to halting logging of mature forest, to canvass public response and evaluate the mix of environmental, economic and social costs and benefits.

The zero or "no action" alternative is used to facilitate comparisons and provide a reference point for decision makers (e.g., PEIS for long term waste management, Folio 6.5). Sometimes, it may be a feasible response, representing a political compromise between competing preferences as in the Lake Burullus case and, possibly, the Australian Timber Inquiry. Multi-criteria analysis was used to determine preferences in the Lake Burullus case (Folio 6.6) where issues were politically sensitive. In some cases, particularly with a technical focus and a limited set of alternatives, the most appropriate environmental option (or equivalent designation) is reasonably clear. This is less evident in other cases, especially where there is a broad mix of alternatives. Methods to weigh and aggregate environmental impacts, used in a number of cases to aid comparison and political judgment, can be helpful -- provided controversies are avoided (see Folio 6.4).

Impact Analysis and Mitigation

At the core of SEA is the analysis of environmental effects and consequences. Several of the case studies include examples of the application of "impact methods" listed earlier. The selection of methods employed in these cases depend on a combination of factors including (DHV Environment and Infrastructure, 1994):

- the level of generality of the proposal;
- the nature of the issues to be assessed;
- the scope, magnitude, and potential significance of effects;
- the requirements of decision making; and
- the time and resources available.

In many SEAs, there is a significant uncertainty factor to deal with impact identification and analysis. This occurs as a result of the greater level of abstraction found in policies, plans and programmes, as compared to projects. For example there may be a mix of development assumptions, concepts, broad alternatives, and project specific elements that require different methodologies. The uncertainty introduced in impact identification and analysis is magnified in each succeeding stage, for example, in establishing mitigation measures and the consequences of different choices. Methods to identify, analyze, and clarify uncertainty that have proven useful in SEA include use of scenarios, sensitivity analysis and expert judgment -- drawing on experience, knowledge, and similar cases (see Folio 6.7).

The role and scope of mitigation in the SEA cases reviewed is illustrated in Box 6.10. What emerges at this level is a suite of approaches. Notable features include the amendment of policy and planning frameworks and strategies for environmental management, as well as the application of specific measures. In this context, SEA has proven effective in pre-identifying environmental issues, and establishing forward siting, planning, assessment, and management regimes for individual projects. This expanded response to impact mitigation is important because it connects SEA to on-the-ground environmental benefits and improvements. (It also appears to be a theme that is widely overlooked in the literature.)

Box 6.10 Examples of Use of Mitigation in SEA

The approaches to mitigation represented in the case studies reviewed include:

- Reflected in the objectives of the proposal assessed, example: Danish Bill on Protection of the Coastal Zone (Folio 6.1);
- Established by policy response or institutional arrangements, example: North American Free Trade Agreement (Folio 6.8);
- Specified by particular measures for:
  - avoiding, offsetting, ameliorating or compensating impacts;
  - modifying land use plans or resource management mix;
  - introducing user fees on pollution changes; and
  - examples: German Road Building Programme (Folio 6.10), Estonia District Heating Programme (Folio 6.11).
- Carried forward in rules and guidelines for:
  - future siting and routing of subsequent projects;
  - pollution control and emission standards; and
  - examples: Sichuan Gas Development and Conservation Plan (Folio 6.12).

Review of Quality

As described previously, some countries have provision for independent review at the level of SEA of specified plans and programmes. Where these are in place they are generally regarded as adding significantly to the level of quality, objectivity, and influence of the SEA process. Quality assurance is seen as particularly important at the reporting stage prior to submission to decision making. However, external reviews or expert advice can also be helpful at the scoping and other stages. Recent experience of the Dutch EIA Commission exemplifies these points:

- *Advice on Guidelines for a Provincial Waste Policy Plan*: The Commission recommended focusing the SEA on the impact of policy on the various waste flows (e.g., industrial, chemical, household etc.) rather than on the environmental effects per se. Dealing with waste early in the disposal chain (e.g., prevention versus incineration) lowers the environmental impact. Using this as a yardstick helped focus the SEA on key options, while reducing the time and resources for study preparation at this level.

- *Review of SEA of Provincial Contaminated Silt Plan*: The focus was on environmental effects of alternative disposal strategies (e.g., underwater versus land dumping versus maximum treatment). In this instance, the Commission's advice was that the information provided was insufficient to support a choice between the policy alternatives, because the environmental effects would be determined to a large extent by soil and geohydrological conditions at disposal sites and by the technical design of facilities.

Documentation for Decision Making

SEA reports can range from a paragraph or page (e.g., for certain Danish bills) to a programmatic EIS (e.g., for a ten- or 30-year waste management strategy). Quality of information and relevance of decision making matter far more than size. In general, a SEA can be considered to be of good quality if it provides decision makers and other parties involved in the process with a concise and clear description of:

- the proposal and its overall policy/planning context;
- the environmental consequences of policy options and how these alternatives compare;
- the difficulties encountered in the assessment and the resulting uncertainty in the SEA results;
- recommendations on terms for approval and implementation of the proposal, together with, clarification of trade-offs; and
- arrangements for monitoring and post decision analysis.

6.5.3 Extending SEA to Address Cumulative Effects

Cumulative effects are the net result of environmental impact from a number of projects and activities. By definition, they are combined within a time and space framework established through direct and indirect activity effect relationships. This is typically bio-regional in scope, but can be extended to larger scale, cross regional effects. Acid rain and the long range transportation of air pollutants are well documented examples (e.g., circumpolar Arctic). In addition, there are truly global and pervasive cumulative effects, such as climate warming and loss of biodiversity, that are ground in the overall pattern and tempo of human activity.

As stated earlier, SEA can and does facilitate the analysis of cumulative effects. Where policies, plans and programmes lead to projects and activities, SEA permits an early, overall look at their potential relationships and impacts. Compared to project EIA, the scope of SEA is more appropriate to the time and space scales at which cumulative effects are expressed. On the other hand, however, impact relationships are much more attenuated and uncertain at the strategic level. Many factors can intervene to modulate the translation of policies, plans and programmes into specific types of projects with potential impacts.

It is also evident that many methods developed for project EIA have limitations and qualifications when used to address cumulative effects. So long as these are recognized, however, they should not preclude SEA of policies, plans, and programmes from considering cumulative effects. At the very least, a qualitative analysis and preliminary identification of possible types of cumulative effects can be given. These can serve as an early warning system, sign-posting further requirements for project EIA, environmental monitoring, and other forms of review.

Several frameworks and approaches for analyzing cumulative effects can be used in SEA. These variously define and correlate complex cause-effect relationships (CEARC, 1986):

- *sources* -- the pattern and timing of activities that cause or will potentially initiate environmental change;

- *effects* -- the syndrome of impacts and long-term changes that occur in response to perturbation and stress, etc; and

- *processes* -- the ecological pathways, mechanisms, and triggers that structure accumulation of effects.

Each of these elements provide an appropriate focus or point of entry for SEA to address cumulative effects:

- sectoral or programmatic level SEAs can focus on *sources* -- the activities that lead to cumulative effects. In Europe, road and transportation strategies have been a particular target for SEA;

- regional plans shift the attention toward *effects* and the sensitivities and capacities of the receiving environment, as indicated by keystone species. In the US, studies of the cumulative effects of development on watersheds, wetlands, and fish and wildlife stand out; and

- policy appraisals may benefit from taking a synoptic, *process* perspective of relationships and consequences. They can be valuable in identifying large-scale, global implications and issues associated with major economic initiatives, e.g., emissions of CO_2 and other greenhouse gases implicated in global warming.

With reference to specific policies, plans, or programmes, cumulative effects may be assessed from four different standpoints, including:

- accumulation of the same impact of a number of projects, e.g., dioxin emissions of a number of waste incinerators in a region;

- accumulation of different impacts from a number of projects -- for a certain class of impacts, e.g., neighborhood noise from all sources; and for different classes of impacts, e.g., the combined effect on human health from all sources of environmental pollution; and

- accumulation over time (whether the same or different types of impacts), e.g., build up of toxic contaminants and trace elements in ecosystems.

A number of existing methodologies can be adapted to analyze the above types of cumulative effects. Early developments in this area have focused on expanding matrix methods and network analysis. However, interaction and network matrices that identify all possible direct and indirect configurations of effect, especially from multiple sources, quickly become complicated and loose their practical value. The most useful examples express source-effect linkages based on a limited number of common denominators, and relate these back to the policy and institutional sources responsible for the problem.

6.6 Research and Development Agenda

Well-focused research and development programmes are necessary to take forward SEA processes. The EU Workshop Report on EIA Methodology and Research (Cassios, 1995) includes a draft research "agenda", that covers both EIA at the project level and SEA of policies, plans, and programmes. The list of SEA research priorities corresponds closely to ones that are indicated by the analysis in this report (see Box 6.11). The process followed, moreover, was distinguished by a significant degree of international consensus; it was also supported by the European Commission and should help to focus research by the participating countries.

In conclusion, the research and development agenda set out here has wide application and represents a useful starting point for other countries and organizations. By definition, however, the focus of the Delphi workshop was on methodology, broadly considered to include its relationship to current provisions and procedures. The institutional research needs associated with the framework of SEA law, policy, and process are still incomplete. As reviewed here, national and case experience indicates several additional requirements in that regard. These include a better practical understanding of:

- configurations of policy making to which SEA applies (e.g., institutional mapping);
- integration of EIA and SEA (e.g., studies of experience with tiering);
- administration and oversight of SEA provisions (e.g., how to ensure compliance; and implementation).

Box 6.11 SEA Research Priorities

The following priorities (not ranked) were identified at the Delphi Workshop of European EIA Centres:

- use of environmental information in decision making for PPPs
- concerns of policy makers regarding the use of SEA and how these can be reduced
- applicability of existing EIA and policy/plan analysis methods for use in SEA
- integrated environmental-economic-social evaluation at this strategic level
- criteria for determining the significance of strategic-level impacts
- screening and scoping of the indirect and cumulative impacts in SEA
- the practicalities of public participation within the SEA process

Source: Lee, 1995.

6.7 Key Points: Summing up This Chapter

Status of the Field: Sharpening concepts and reconsidering terminology

SEA is a rapidly evolving field. The concepts and terms used to describe this process and its component parts have not kept up with the diversification of systems and approaches. Recent changes point toward a reconsideration of "SEA" as a multi-story process that covers different levels and aspects of the spectrum of development decision making. Key stages are:

- sectoral and programmatic EISs;
- regional assessment and plan evaluation;
- policy and programme assessment
  - parliamentary bills,
  - cabinet submission,
  - government-wide policy appraisal; and
- EA as integral part of comprehensive policy and plan-setting.

Uses and Benefits of SEA: Six advantages from process application

A review of experience among countries and international organizations that have established SEA processes shows these deliver major dividends including the following:

- incorporation of environmental considerations into all stages and many sectors of policy making;
- promotion of inferred and integrated decision making consistent with the approach outlined in Agenda 21;
- clarification of environmental objective, alternatives and implications of development policies, plans and programmes;
- identification of positive, environmentally friendly options and opportunities;
- adoption of a range of impact mitigation measures; and
- modification of policy, plan, and programme proposals to take account of environmental considerations.

Enabling Conditions for Process Effectiveness: Laying the groundwork for success in SEA

The building blocks of an effective SEA system comprise:

- a requisite level of political commitment and organizational support;
- clear provisions and requirements (e.g., guidance);
- "fit for purpose" process(es) that relate form to function (not vice versa);
- use or availability of appropriate methods and techniques;
- mechanism(s) for overview and monitoring, compliance and performance; and
- follow-up and feedback capability.

Framework of "Good Practice": A seven step approach

The activities outlined below need to be applied flexibly and alternatively; consistent with key principles (q.v.) and tailored to the consequently of the proposal under review:

- *Screen to trigger SEA* and identify likely scope of review needed.

- *Scope to identify key issues* and alternatives, clarify objectives and to develop terms of reference for SEA.

- *Elaborate and compare alternatives* include no action options to clarify implications and trade-offs.

- *Undertake an impact analysis* or policy appraisal to examine effects (issues), evaluate alternatives, and identify mitigation and follow up measures.

- *Document the findings* of the SEA if necessary, with supporting advice and recommendations to decision makers on terms and conditions for implementation.

- *Check the quality* of the SEA report to ensure it is clear and concise, and the information is sufficient and relevant to the decision being taken.

- *Establish necessary follow up* measures, e.g., for monitoring effects, checking implementation, and tracking any arrangements for subsidiary level assessment.

Lessons on Moving Forward: Points to note from case experience

The following advice, gained primarily from SEA practitioners themselves, helps take forward the above framework:

- Begin as soon as feasible in the process of policy, plan or programme formulation.

- Start with a "reality-check" that recognizes:
  - assessment is part of a larger process;
  - the purpose is not to produce a study but to inform decisions; and
  - integrating environmental concerns likely implies a change in organizational culture.

- Time spent in preparation can be an up-front investment that is recouped later.
- As a rule of thumb, the specificity or generality of assessment corresponds to that found in a proposal.
- Look to promote environmental benefits, as well avoid adverse impacts, for alternative approaches.
- Use the simplest procedures and methods consistent with the task.
- Getting the right information to decision makers at *the right time* is crucial; otherwise the SEA, no matter how high a standard, risks being irrelevant.

A final word: In some cases, review of experience and workshop discussion suggests a tendency to include more information and undertake more sophisticated analysis than is strictly necessary for the task at hand, possibly influenced by the prescriptive literature on the field. Disciplined scoping, backed by review of SEA quality, can correct over-elaboration.

Folio 6.1:
SEA of the Bill on the Protection of Coastal Zones, Denmark

Background: The aim of the bill is to improve the protection of Danish coastal zones. Nature and landscape values are to be effectively protected, while not prohibiting all new developments at the coast (e.g., recreation). Further objectives relate to health and the creation of diversity corridors for flora and fauna.

Analysis: The SEA included descriptions of valuable coastal zone elements that need protection, and of landscape, recreational values, flora, fauna, and visual aspects to be taken into account in the implementation of new developments. Assessment was essentially qualitative. This is probably due to the fact that the bill itself has an environmental objective. The SEA report itself consisted of 600 words, and additional information on environmental protection was also included in attached documentation. In many respects, the SEA can be judged as good quality. It is not expected that the SEA will have direct value for subsequent project EIAs and approval procedures in the coastal zones. On the other hand, the planning and regulatory framework as laid down in the bill is presumed to enhance the effectiveness and quality of project EIAs.

Lessons: The SEA process and documentation:

- was short and to the point;
- helped to focus the environmental issues and advance protection objectives; and
- exemplified a cost-effective approach to assessment of sustainability legislation.

Source: Elling, 1994.

Folio 6.2:
SEA of the 2nd National Structure Scheme Electricity Supply, the Netherlands

Background: The sector plan describes the long term strategies for electricity supply in the Netherlands, including particular decisions on facilities siting, fuel type, generating capacity, and line routing.

Analysis: High and low scenarios for electricity demand in 2010 were developed. These were based inter alia on differing assumptions about growth of the economy and energy saving. Based on these, two alternatives for the mix of fuel types to be used in electricity generation were identified: 50% natural gas/50% coal; or 33% coal/67% gas of oil gasification.

For both alternatives a number of variants were developed on the basis of differing choices regarding technological options and mitigating measures. The alternatives/variants, in both the high and the low demand scenario were assessed using such environmental parameters as emissions, waste and residues, and use of natural resources.

Potential locations for power stations were assessed regarding their suitability using the following environmental criteria:

- thermal effects;
- other effects on surface water quality;
- effects of fuel transport to and from the location;
- spatial impacts, e.g., landscape distorting and effect on habitats;
- noise; and
- safety, including radiation.

Lessons: The SEA:

- was a thorough, well structured assessment based on existing data in literature;
- SEA had a major impact on the structure scheme finally adopted; but
- covered some aspects in more detail than strictly needed for decision making at this level.

Source: Verheem, 1992; DHV Environment and Infrastructure, 1994.

Folio 6.3:
SEA of the European High Speed Train Network

Background: A European High Speed Train (HST) network is proposed to respond to increasing transport demand and environmental problems of road and air transport in Europe. An outline plan has been drafted for 9800 km of new line (speeds to 300Km/hr) and 14,400 km of upgraded line (speeds to +200Km/hr). The proposal was subject to an SEA.

Analysis: Four alternative scenarios for the outline plan were developed:

- existing situation as of 1988;
- reference situation 1 (2010 situation) assumes no further extension of the existing network would take place, transport demand is met by car, plane and classical train;
- reference situation 2 (2010 situation) taking into account the extra mobility a full fledged HST network would generate (= the same mobility as in the proposed outline plan); and
- the proposed outline plan (preferred situation).

Environmental impacts and issues were broadly assessed to include: primary energy consumption, air pollution, noise pollution, spatial impact, i.e., land use, landscape sensitivity, etc., and traffic safety. The methodologies used for this purpose included: GIS, traffic simulation modeling, expert judgment, and extrapolation of known data. Both technological developments and national environmental policy objectives were taken into account. The study forecast that the HST network would change the model split of intercity travel. A "with" versus "without" proposal comparison indicated the HST network would reduce air pollution, lower energy consumption, and improve safety (estimated against a roughly equivalent network of main roads and commercial flights).

Lessons: The SEA

- documented the relative environmental gains associated with the proposal based on a comparison of alternative transport modes and scenarios; and
- applied quantitative methods to predict total (absolute numbers) and relative impacts (i.e., per passenger/Km).

Source: DHV Environment and Infrastructure, 1994.

Folio 6.4:
Appraisal of Options for Management of Solid Radioactive Waste, UK

Background: The safe long term management and disposal of different radioactive waste streams is a major environmental issue in the UK. The overall objective of this policy appraisal initiated by the UK Department of the Environment (DOE) was to "identify alternative strategies for storage and disposal of low and intermediate level waste which would be the optimum from a number of different viewpoints".

Analysis: A multi-attribute approach was used to determine preferences between acceptable options for the management and disposal of the waste. This approach was chosen because the subject is one on which there is a wide divergence of opinion. Five options were determined for the management of the waste: sea disposal, offshore boreholes, and three forms of land burial (shallow, engineered trench, and deep cavity). The impacts considered within the assessment included: costs; occupational collective doses of radioactivity; and collective dose to the public nationally, regionally, and globally, from both storage and disposal.

To evaluate the acceptability of each of the options, four sets of weights were developed. These were designed to reflect distinct sets of views perceived to be held in society:

Set I: emphasis on reducing costs, but taking into account the risk to workers in the industry, and short term collective doses to the public;

Set II: less concerned with costs; more oriented to reducing risk to individuals and collective doses; low weight given to impacts in the future;

Set III: very concerned with local impact, with high weight given to reducing risks from accidents at storage facilities; and low weight given to cost; and

Set IV: low weight on cost, and a high weight on reducing doses to the public. (Note that in Set IV (the environmental option) the weight given to doses to workers is 100 times Set I).

The results were used at two levels. First, to identify the options which resulted in the lowest level of impact and, secondly, to illustrate the implications of choosing one option over the others for a particular waste stream.

Lessons: The appraisal concluded that:

- shallow burial for all weighting sets was the best option for low-level and short-lived waste;
- the increased costs of other options outweighed the small predicted differences in radiological impacts;
- the preferred option for Magnox wastes containing long lived materials was ten-year storage followed by disposal in an engineered trench; and
- for other waste streams the choice varied considerably depending on the weighting set being considered.

Source: U.K. Department of the Environment, 1991.

Folio 6.5:
Programmatic Environmental Impact Statement for Environmental Restoration and Waste Management Programme, United States

Background: At present, most environmental restoration and waste management activities are conducted on a site-by-site basis. Recently, the US Department of Energy undertook a long term (30 year) integrated approach to these tasks. Key elements of the programme include: environmental clean-up of existing sites, spent nuclear fuel management, and treatment of six waste "streams" (e.g., high-level waste; transuranic waste; low-level mixed waste; greater than class C level waste; hazardous waste).

Analysis: During an initial, three month phase (1990-1991), the Department conducted 23 scoping meetings and six regional workshops. Over 1200 people intervened or submitted written comments. Subsequently, a draft implementation plan (1992) and a draft PEIS (1994) were issued for public and inter-agency review and comment. The final PEIS was issued in 1995.

The draft PEIS focused on programmatic alternatives for environmental restoration and waste management. As well, the Department of Energy prepared a PEIS for reconfiguring its nuclear weapons complex and for managing spent nuclear fuel. Preparation of these documents was coordinated with the environmental restoration and waste management PEIS, which summarized the cumulative effects of all proposed programmes.

Waste management alternatives were examined for each of the categories of waste. These encompassed continuation of current approach, (no new action); decentralized, regionalized, and centralized approaches. Five environmental restoration alternatives were considered in the draft PEIS.

Risks and impacts were evaluated for each set of alternatives. The impact analysis was primarily qualitative and descriptive, using standard modeling. Methods and application of risk assessment incorporated guidelines established by the US Environmental Protection Agency and were subject to peer review.

Lessons: The PEIS resulted in:

- incremental inputs to technical and political decisions throughout the process;
- a comparative examination of alternatives for long term solutions to environmental waste problems; and
- clear recognition of the inherent uncertainties associated with health and ecological risk and impact analysis of contaminated facilities.

Source: Sigal and Webb, 1994.

Folio 6.6:
SEA of the Lake Burullus Development Plan, World Bank/Egypt

Background: Lake Burullus is a coastal lagoon, situated on the Mediterranean coast. It is listed as a Ramsar site (i.e., wetland of international significance). For local communities, the lake is an important fishery. A SEA was carried out to investigate policy options for socio-economic development and resource management, and their possible impacts and trade-offs. From the start, the main aim was to integrate socio-economic and ecological issues in the analysis.

Analysis: Lake Burullus was interpreted as an ecological system with 22 functions; e.g., fishery, water purification, biodiversity, scientific value/significance for breeding, migrating and wintering birds. Preliminary studies indicated that the ecological and the socio-economic system are not in equilibrium; e.g., too many fish are caught. Four policy scenarios were developed and assessed against such criteria as investment and recurrent costs of policy measures, ecological functions, income in the fishery sector, and public and private sector risks.

Monetary costs (direct costs, fishery income, agricultural benefits) and externalities (including qualitative ecological costs and benefits) were assessed in a cost benefit analysis (CBA). Because Lake Burullus is a politically sensitive issue, a multi-criteria analysis was carried out to complement the CBA. The results showed that different society groups valued the options quite differently.

Lessons:

- *Expert judgment* -- assessment of uncertainty on the basis of qualitative judgments, drawing on expert advice and the results of similar actions in the past. Experts (inside or outside the government) should be asked to judge the likelihood of the different possibilities, using their experience and knowledge.

- *Graphical methods* -- a number of methods exist, for example indicating band width in graphics.

- In most SEAs, there will be a significant uncertainty factor to deal with in the analysis. This uncertainty, however, does not preclude an effective SEA. Normally, the environmental information provided in the SEA will still make it possible to distinguish among alternative policy options and to determine mitigating measures needed.

Source: World Bank, 1995.

Folio 6.7:
Forest and Timber Inquiry, Australia

Background: The Forest and Timber Inquiry was the first reference issued by the Prime Minister under the *Resource Assessment Commission Act* (1989). The Commission was to identify and evaluate options for the use and management of Australian forest and timber resources. It was to take into account existing strategies for this purpose as well as alternative proposals made by the Forest Products Industry and the Australian Conservation Foundation.

Analysis: The inquiry combined industry and government submissions, public hearings, and independent technical analysis. Major study components included:

- resource capability, tenure, and use inventories;
- evaluation of forest management strategies and institutional arrangements;
- wood supply and demand projections; and
- economic, social, and environmental trend analyses.

A broad survey was undertaken of the social and cultural uses and values of forests, and of community attitudes to management issues. Five strategies of forest use and management were identified, ranging from maximization of timber production to no further logging of native species. These policy alternatives were designed to facilitate public choice and canvass response, including comments on the analytical methodology used.

During the three-year inquiry, the commission compiled and analyzed a mountain of evidence. The final report contained numerous conclusions and recommendations (albeit of a largely general nature).

Lessons: The Forest and Timber Inquiry:

- was a comprehensive, integrated SEA;
- applied on sustainability principles and criteria (specifically equity, ecological integrity and economic feasibility); and
- clarified the choices and trade-offs at stake -- though it did not provide specific (contestable) advice to the government.

Source: Resource Assessment Commission, 1992.

Folio 6.8:
Environmental Policy Review of North American Free Trade Agreement (NAFTA), Canada

Background: Formal negotiation of the NAFTA by Canada, Mexico, and the United States began in June 1991 and concluded in August 1992. It was the first trade agreement to undergo environmental review. Each NAFTA country was responsible for undertaking its own assessment. Canada's review took place under the requirements of the federal process for policy and programme assessment.

Analysis: The objectives of the environmental review were to ensure that environmental considerations were taken into account during the negotiation process and to document the potential environmental effects of NAFTA on Canada. An interdepartmental working committee was struck for this purpose. It met regularly with key members of the NAFTA negotiating team, consulted widely with other advisory bodies, and canvassed input from non-government sources.

The integration of environmental concerns in NAFTA negotiations (objective 1) represented a preventative approach. As such, its day-to-day role was not clear. Without question, however, the representation of environmental concerns had an important impact: it led to the conclusion of a "side-agreement" on environmental cooperation which provided for the establishment of a North American Commission on Environmental Cooperation.

The assessment of the potential environmental effects of NAFTA (objective 2) covered:

- the environmental provisions of the Agreement;
- its impact on Canada's environment;
- potential industry migration to take advantage of less stringent environmental standards; and
- follow up mechanisms for addressing trade-environment relations and issues.

A report on the findings of the review was submitted to Cabinet "no later than the NAFTA". Key conclusions were: NAFTA "establishes a new benchmark for environmentally sensitive trade"; it would have a "measurable impact on Canada's environment"; and "there is likely to be minimal, or no relocation in Canadian industry due to ... differences in pollution abatement costs".

Lessons: The environmental review (also labeled as a policy appraisal):

- catalyzed a parallel process of environmental cooperation;
- positively influenced environmental provisions for implementation of NAFTA; and
- established important precedents for assessment of trade agreements in the future.

Source: Government of Canada, 1992.

Folio 6.9:
SEA of Firth of Forth Transport System, Definition of Appraisal Objectives, Scotland

Background: *Setting Forth* is a transport strategy for South East Scotland in an area around Edinburgh. The policy/plan was subject to environmental appraisal. A six stage approach, corresponding to the DOE good practice guidelines (reported earlier), was followed. Steps 1 and 2 involved the definition, respectively of policy objectives/basic principles and appraisal objectives.

Analysis: In *Setting Forth*, the government established three key principles/objectives for transportation development:

- enhancing accessibility to and from Scotland north of the Forth must be a priority;
- measures taken must improve the environment or Edinburgh by contributing to the role of public transport; and
- any new works must be environmentally acceptable.

Using these principles, a set of "working" objectives were defined against which policy options could be appraised. Two additional requirements of government policy were added, namely that any new transport infrastructure should have a positive economic benefit to users and that the policy should respect the principles of sustainable development as set out in the UK Sustainable Development Strategy and Agenda 21.

Thirteen appraisal objectives were defined, each expressed in terms in which the performance of policy options would be measured. Environmental objectives, for example, included the following:

- to minimize emissions of carbon dioxide and other traffic related pollutants;
- to minimize loss of or damage to resources of importance to nature conservation, landscape and cultural values; and
- to minimize impact on local environmental quality for residents and others.

Most of the objectives were directional; they were expressed in terms of maximizing or minimizing some effect, though some absolute targets were set.

Lessons: The appraisal exemplified an "objective-led" approach, that:

- starts with a clear understanding of purpose and principles of the proposal; and
- translates these into "working" objectives for appraisal; e.g., against which options can be assessed and the implications of choice clarified.

Source: Raymond, 1995.

Folio 6.10:
SEA of the Nordrhein-Westfalen Road Programme, Germany

Background: The German states (lander) prepare five-year programmes for the extension of road networks (with the exclusion of national highways). Environmental objectives are an important component of these. A SEA was carried out for the road programme of the State of Nordrhein-Westfalen, comprising the routing and general design of 240 newly proposed regional roads.

Analysis: Routes and designs were developed in three stages: In step 1, the sensitivity of the environment for road development was mapped out with the aid of a GIS (incorporating baseline data on residential areas, valuable habitat, water resources, landscape, amenity, etc.). In step 2, the various sensitivity criteria were aggregated into an overall index, and routes were optimized for passing through the least sensitive areas. In step 3, the environmental impact of the optimized routes on high value areas and factories was estimated.

Mitigation measures were proposed where environmental "bottlenecks" - or impact concentrations - occurred. Residual impacts after mitigation were classified for each section of the programme as "extraordinary", "above average", "average", and "small". Impact amelioration by mitigation measures was classified as high, medium, and low.

Lessons:

The lessons included:

- SEA methodology is open to criticism, especially with regard to the baseline data and aggregation method used;
- however, the environmental quality of the resulting proposals is much better with than without the use of SEA; and
- each specific section of motorway will be subject to a project EIA, thereby tiering project EIA to the programme SEA.

Source: DHV Environment and Infrastructure, 1994.

Folio 6.11:
SEA of the District Heating Rehabilitation Project, Estonia

Background: This World Bank project supports the improvement of district heating systems in Estonia's three largest cities - Talinn, Tartu and Parnu - and in smaller towns and villages throughout the country. It is intended to reduce fuel costs and impact requirements by increasing the use of indigenous fuels, peat and wood for heating. A sectoral EA was prepared by a joint international and local team to evaluate the potential short- , medium- and long-term environmental impacts of harvesting, processing, and using peat and wood as fuels.

Analysis: The SEA was undertaken during the design phase of the project. It analyzed possible alternative programmes for the sector as a whole, including the following:

- continuing to rely on heavy fuel use (business as usual);
- introducing more modern boilers and heat distribution networks using imported fuel and modern air pollution control equipment; and
- relying solely on peat or wood fuel.

After considering economic, social, and environmental factors, the proposed mix of fuels and technology upgrading was selected as the best option. In addition, environmental reviews were also undertaken for a number of sub-projects (e.g., measures to protect biodiversity). The SEA process helped shape the project through both a series of policy recommendations for the sector, and the identification of concrete mitigation, management, and monitoring measures for sub-projects. Additional reviews will be held to assess use fees for public and private harvesting of peat and wood, including management and site rehabilitation costs. Peat harvesting is to be conducted at a currently drained site, and wood fuel harvesting should occur in the context of forest management plans. The Estonian Ministry of the Environment, which manages natural resources and is responsible for the implementation of results in cooperation with other organizations, took an active role throughout the process.

Lessons:

The SEA:

- was rated 1.00 by the Bank in terms of environmental performance (no significant problems);
- had a significant impact on overall programme design and sub-project implementation; and
- involved close collaboration with the domestic agency primarily responsible for follow through on the results and recommendations.

Source: World Bank, 1993, 1995.

Folio 6.12:
SEA of the Sichuan Gas Development and Conservation Plan, People's Republic of China

Background: The province of Sichuan, People's Republic of China, proposed to further develop production of natural gas. The Plan covered activities to be financed by the World Bank, including seismic survey, exploration drilling, production, and transportation of natural gas. The SEA and the Plan were prepared simultaneously with the aim of identifying environmentally sound technologies and siting rules for projects and pipeline routes, and rehabilitating the existing transmission system to improve performance and eliminate methane gas emissions.

Analysis: As part of the SEA process, studies were carried out to ensure that all phases of the Plan and project design conformed to international engineering and safety standards and to sound environmental management practice. Site selection rules and procedures for project EIAs were based on emission standards. Using a worst case approach, it was found that local environmental impacts could be minimized to an acceptable level. The worst case was defined by case studies for safety assessment, noise, and ambient air pollution, and based on generalized cases (i.e., hypothetical plants with an assumed typical environment for Sichuan, surrounded by sensitive areas as close as possible under the proposed siting rules). Public consultation was built into the siting process. Both the Chinese authorities and the World Bank reportedly considered the SEA was an effective approach to defining environmental issues and prevention/mitigation scenarios for individual projects. Subsequently a comprehensive mitigation plan was established including measures for gas leakage detection, waste management, groundwater protection, and treatment of waste gas for sulfur recovery.

Lessons:

The SEA:

- was rated 1.00 by the Bank in terms of environmental performance (i.e., no significant problems);
- helped to integrate environmental and development on local and regional levels; and
- supported implementation of a gas development and conservation plan aimed at reducing coal consumption and consequently CO_2, SO_2 and particulate emissions.

Source: World Bank, 1995; DHV Environment and Infrastructure, 1994.

Folio 6.13:
Some Methods for Impact Identification In SEA

Literature search:

State of knowledge -- survey to identify linkages between policy actions and environmental impacts, "State of the Environment" reports and environmental policy plans will be useful documents to start with;
Case comparison -- of examples from other policy domains or jurisdictions; analysis of similar actions in other countries can provide insight into the possible impacts of policy options.

Expert judgment:

Delphi survey -- iterative canvass of opinions and perspectives from recognized "experts" in pertinent fields;
Workshops -- structured meeting with a problem-solving focus, e.g., to develop alternatives or map possible impacts.

Analytical Techniques:

Scenario development -- projections, based on reasoned assumptions, to outline and compare the means by which, or conditions under which, a proposed action may be implemented; e.g., "best" versus "worst" case scenario of risks and impacts;
Model mapping -- identification of cause-effect networks to qualitatively illustrate linkages; e.g., policies will influence plans and programmes, which will subsequently initiate projects;
Checklists -- those developed for project EIA have proven useful at the strategic level, in original or modified form;
Indicators -- often, it will not be appropriate, possible or necessary to predict all environmental impacts of a proposed policy; instead, screening against relevant indicators may be sufficient for the purposes of SEA.

Consultative Tools:

Interviews -- with experts, opinion leaders, political representatives, etc.;
Selective consultation -- with key interest groups and/or communities and sectors directly affected by a proposed policy, plan or programme;
Policy dialogue -- round table or other multi-stakeholder process to clarify issues, determine consequences and identify options that meet the concerns and interests represented.

Folio 6.14:
Some Methods for Impact Analysis in SEA

Extended use of identification methods

In most SEAs, relatively simple and straightforward methods will be sufficient. Examples include: literature survey, case comparison, expert judgment, scenario development and model mapping. This last technique is reported to have been effective for SEA. Often, it has proven possible to sufficiently quantify environmental indicators by filling in each parameter of the impact networks, based on data from literature, indicative calculations or expert judgment.

Use of matrices

Grid diagrams can be used to cross-reference a list of (sub)actions to a list of environmental impact parameters. Most SEAs make use of matrices in some form. The UK Guide on SEA for Structure Plans recommends them as the main tool, including their use for consistency analysis to identify potential conflicts between objectives in different policy sectors.

Computer modeling

In some countries, computer models are used to calculate the impact of strategic options on environmental indicators. For example, these have been applied to habitat supply analysis in Canada and the US, and to simulate the impact of tax policy on (national) energy use, vehicle mileage, and use of public transport.

Geographic Information Systems (GISs)

These are especially useful in land use planning, routing studies, and assessing cumulative impacts of several project in the same area. Also may be used to support impact analysis, e.g., calculation of land occupation or measuring environmental impacts as function of distance to pollution sources.

Cost effectiveness analysis

Used to select the option which achieves a target or goal at least cost (environmental or financial). This is a useful technique in cases where actions are clearly constrained by existing (environmental) targets or objectives, for example, ambient air and water quality standards, emission limits or resource harvesting allocations.

Cost-benefit analysis (CBA)

Technique in which as many impacts as possible are expressed in an unified value; the benefit-cost ratio is a basis for choice among the options reviewed.

Multi-criteria analysis (MCA)

This is an advanced form of CBA in which separate scores on a number of key evaluation criteria are given, rather than using one, unified value to express the significance of all impacts, (as is the case in CBA). Using mathematical operations, combinations of weights and criteria scores provide a ranking of options. The advantage of MCA over CBA is that it allows for the joint analysis of both environmental costs and financial costs, even when the environmental costs cannot be valued in monetary terms. MCA does not necessarily lead to one, unambiguous solution; it generally leaves some freedom to decision makers. A specific form of MCA is the "goals achievement matrix" which helps identify how an action may potentially contribute to a set of specified (environmental) objectives.

Aggregation methods

Used to translate "groups of indicators" into one, composite indicator. The aim is to make the total amount of environmental information more manageable. In this process, results are often weighed against each other and "trade-off" choices made. In principle, these are political decisions, and therefore, care should be taken in using aggregation methods for SEA. Usually however, some aggregation is needed and possible without generating controversy. Some methods are:

- index methods - aggregation by valuation and weighted summation;
- monetary methods - all impacts are translated into one unit: money -- as yet, these are insufficiently developed for use in EA.

CHAPTER 7:
ENVIRONMENTAL ASSESSMENT FOR SUSTAINABILITY ASSURANCE

This chapter describes principles and options for strengthening EA as a mechanism for sustainability assurance, i.e., redirecting the aim and approach of the process to ensure that development planning is consistent with a precautionary approach to maintaining the regenerative and assimilative capacities of natural systems.

7.1 Introduction

EA is acknowledged to be an important tool for giving effect to sustainable development objectives in planning and decision making (Jacobs and Sadler, 1989). In practice, the use of EA as a sustainability mechanism within a particular jurisdiction will depend on a number of factors. These include:

- the role, scope, and integrity of the EA process that is in place, e.g., whether policies as well as projects are included;
- the larger mix of environment and economic policy and planning instruments that are used for decision making; and
- the degree to which there is a policy commitment to sustainable development, as demonstrated by strategies or action plans and measures to implement them.

The best case situation would be where the EA process and sustainable development strategies are both reasonably well advanced. A number of countries meet these general pre-conditions. In these circumstances, there is a basis for strengthening EA as a tool for *sustainability assurance*, i.e., ensuring, as far as possible, that the full costs of development proposals are identified, mitigated, compensated or offset, consistent with the maintenance of the "source" and "sink" functions of natural systems. Drawing on earlier discussion, this chapter describes some options and measures for progressively instituting such an approach. The focus is on the building blocks for establishing a next-generation process of EA for sustainability assurance (ESA), recognizing this will need to be scaled and adapted to the institutional arrangements and opportunities that apply in different countries.

In this context, possible frameworks and methodologies to address global change considerations in the EA process are also described. The emphasis is on meeting the principles and provisions of the United Nation (UN) conventions on climate change and biological diversity. Both conventions represent an important focus for the extension of assessment-based approaches to address pressing and serious sustainability issues. As such, they also comprise testing cases for practical applications of the EA process.

7.2 Sustainability: From Concepts to Policy Analysis

Sustainable development remains an unfinished concept. Recently, however, considerable progress has been made in clarifying key elements, relationships, and approaches to policy analysis. These provide a framework or context for reviewing the particular contribution that EA can make to advancing sustainable development. For present purposes, four themes are relevant:

- sustainable development as an all encompassing concept that links ecology, economics, and ethics;
- the relationship of ecological processes and human activities including valuation of the environment;
- the use of addressing uncertainty, capacity, and thresholds of natural systems; and
- precautionary principles in EA and decision making.

7.2.1 About Sustainable Development

Current thinking about sustainable development stresses the importance of simultaneously considering economic, environmental, and social goals in policy design. This integrative perspective is recognized as fundamental to examine the interdependencies that are involved in the predicament of development, and as difficult to nail down in practical terms. The concept of sustainable development brings together three major policy clusters:

- *ecological integrity* -- the "self-organizing" capability of natural systems to maintain their structure and functions in the face of natural fluctuations, imposed stress, and irregular events;
- economic *output or "growth"* -- to improve standards of living (real income per capita) and the quality of life, e.g., health and education services; and
- *social equity* -- the fairer distribution of income and opportunities among existing (intra-generational equity) and future (inter-generational equity) populations.

The reconciliation or balancing of these policy values remains a formidable challenge. Firstly, there is no integrated methodology available for this purpose and the criteria, tools, and approaches used by economics, ecology, and sociology to evaluate policies and projects differ. Secondly, trade-offs among the commonwealth of goals is unavoidable when specific decisions are taken. Within a sustainability framework, this does not mean policy or business as usual, e.g., as reaffirmed by the reconvened World Commission on Environment and Development (1992). At a minimum, it is important to ensure the process of trade-offs is disciplined such that economic, environmental, and social objectives are all met at some "threshold level". The determination of sustainability by reference to capital stocks is helpful for this purpose.

7.2.2 The Relationship of Sustainability and Capital Stock

Sustainability means passing an equivalent or greater (recognizing that population is increasing) resource endowment or capital bequest to the next generation, so that it has the same or better opportunity to meet its needs as the present generation. In this context, three categories of capital stock are important: human-made, e.g., factories, farms, infrastructure; natural, e.g., renewable resources and living species; and human/social, e.g., knowledge, institutions, and cultural and civic traditions. Ecological and environmental economists identify the maintenance of natural capital as the enabling condition for achieving sustainability. This reflects current rates of resource depletion and environmental deterioration, which now constitute, at the very least, development constraints (and possibly threaten human survival). Seen in this light, traditional economic assumptions about the sustainability of man-made and natural capital have been modified significantly.

This relationship provides the basis for establishing different levels of sustainability. Depending on how strictly the natural capital component is interpreted, three sustainability conditions can be recognized (Serageldin and Steer, 1994):

- *weak sustainability* is represented by a constant or increasing stock of capital without differentiation among the three categories;
- *moderate sustainability* is characterized by the relative composition as well as the overall constancy of capital stock, i.e., natural and human-made capital are partly sustainable up to some future level of carrying capacity and thereafter are complementary; and
- *strong sustainability* is gained by treating the three categories as separate stock "envelopes", e.g., so that natural capital must be maintained at or near current net levels (but does not require the current amount and mix of physical resources and ecological assets to be retained).

7.2.3 Valuing the Environment

Neither free market or centrally planned economies reflect the real economic value of natural capital and these distortions encourage its over-use and depletion. Accordingly, a more systematic understanding of the interaction of environmental processes and socio-economic activities is acknowledged as necessary for informed decision making. The classification system developed by de Groot (1995) for this purpose is a useful starting point. Four types of functions (goods and services) provided by the natural environment are identified as a prelude to their better valuations. These are:

- *regulation functions* -- essential life support systems and ecological processes, e.g., storage and recycling of organic matter, nutrients, and wastes;
- *production functions* -- natural resources, raw materials, and gene pools;
- *carrier functions* -- habitat, living space, and economic activity zones; and
- *information functions* -- amenity, aesthetic, and scientific values of nature.

Until recently, the regulation functions of natural systems were overlooked by comparison to production and carrier functions. This is no longer the case in a greenhouse world of ozone

windows and vanishing species. Recently, considerable advances have been made in valuing ecological goods and services (see, for example, Serageldin and Steer, 1993), recognizing that these are no longer "free", that some are becoming scarce (a traditional trigger for economic analysis) and most are difficult to price, assign surrogate charges for or otherwise quantify as to their benefit, e.g., flow regulation function of wetlands. A taxonomy of total economic value (TEV) is now used to distinguish between three types of benefits provided by natural environments (Pearce and Turner, 1990):

- *user values* -- gained from direct or indirect consumption of ecological goods and services;
- *options values* -- stemming from conservation and protection of landscape and wildlife for either utilitarian or aesthetic purposes; and
- *existence values* -- these are intrinsic to the earth and its life forms and processes and thus unrelated to use or option values.

These emerging economic concepts can be combined with EA as part of a functional evaluation of natural systems, such as wetlands (see Folio 7.1).

7.2.4 Environmental Capacities and Thresholds

Environmental sustainability is the baseline condition of sustainable development in a global economy. For example, it is estimated that 40% of net terrestrial carrying capacity is now used or pre-empted by human activity (Vitosek, *et al.*, 1992). Total environmental impact as a function of population x affluence x technology can be expected to increase roughly commensurate with exponential growth of human numbers and economic activity. In these circumstances, a major concern is to avoid the possibility of structural, irreversible or catastrophic changes, such as desertification, extinction of a key or valued species or the permanent loss of stratospheric ozone protection from incoming ultraviolet radiation.

The notions of carrying capacities and thresholds are widely promoted in the conservation literature as a means of organizing policy response to avoid such possibilities (see Dixon and Fallon, 1989). However, these are imprecise and controversial, even for allocation of "single" resources such as fish and timber. Often, for example, maximum sustained yield models have proven inadequate for fisheries management, as exemplified by the well-documented collapse of several commercial stocks in recent years (Botkin, 1990) -- most recently North Atlantic cod and Pacific salmon in Canadian and international waters. For multiple-use resources, involving the simultaneous achievement of two or more policy goals, the trade-offs and options become correspondingly more complex -- although not necessarily unmanageable provided conservation (or habitat) thresholds are interpreted flexibly and prudently (see Folio 7.2). Some ecologists take a macro-scale approach, equating sustainability with the integrity and stability of natural systems (Constanza, *et al.*, 1992; Woodley, *et al.*, 1993). In this context, the "limits" for development are set by the resilience or self-correcting capacity of large scale ecosystems when subject to the cumulative effects of resource use, pollution emissions, and other factors.[1]

[1] The two approaches are underpinned by different paradigms of resource and environmental management; however, these are not necessarily irreconcilable in that micro-level, prescriptive sustained yield models can be set within a broader landscape matrix and informed by the ecosystem approach.

However, except for severely degraded resources, there is typically a high degree of uncertainty about whether critical ecological thresholds are being breached or transgressed and, if so, what will happen. In many cases, stress-response relationships are non-linear, characterized by irregular and surprise events (Holling, 1986). Accordingly, the penalties for "guessing wrong" with regard to pollution loading or resource extraction can be high or even extreme. Once critical environmental functions are lost or cumulatively damaged, they are either impossible or prohibitively expensive to restore. In this regard, natural capital is unlike man-made and social capital, where investments are routinely made to replace or upgrade infrastructure, improve education levels and so on. This combination of *uncertainty*, *penalty,* and *irreplaceability* summarizes the nature of the challenge to policy analysis and decision making with respect to the sustainable use and development of natural systems, and underlines the importance of establishing appropriate guidelines and modes of approach.

7.2.5 Guidelines and Approaches to Environmental Sustainability

Where environmental degradation is irreversible, severe or widespread, it represents capital liquidation. The World Bank, for one, has recognized that it should not be in the business of funding non-sustainable developments. The operational guidelines established for environmental assessment are meant "to ensure that each project affecting renewable resources (e.g., as a sink for residues or as a source of raw materials) does not exceed the regenerative capacities of the environment" (World Bank 1991, 51). In practice, as the Bank acknowledges, there are many difficulties in applying its input and output rules (see Box 7.1).

As noted, scientific understanding is insufficient for this purpose, and ultimately ecological end-states and limits can only be set in qualitative terms of what constitutes socially acceptable change. (Key questions here are sustainability for what, for whom, and under what time and space scales).

Policy and community mechanisms for this purpose are not yet well developed. In the interim, a series of guiding principles for achieving environmental sustainability in development policy making have gained wide acceptance, for example, as documented in Agenda 21. The following are most relevant:

- aim to maintain the stock of natural capital at or near current levels, e.g., no aggregate/net loss of resource potentials and ecological services;
- institute the precautionary principle to deal with environmentally significant issues where there is a high level of risk or uncertainty;
- employ an "anticipate and prevent" rather than "react and cure" approach; and
- implement the "polluter pays" principle so that the true costs of environmental damage are internalized and borne by development proponents, beneficiaries and end users.

These basic principles provide context and support for the application of "full cost" policy analysis of the environmental consequences of development proposals and activities. Major approaches to evaluating environmental sustainability include (Goodland and Sadler, 1995):

- sound micro-economic analysis of development proposals to internalize costs;

- macro-level environmental accounts to treat resource losses and ecological damage as natural capital depreciation; and
- EA of policy and project-level proposals to identify potentially significant effects on natural systems (impacts, risks, and functional losses).

Box 7.1 World Bank Guidelines on Environmental Sustainability

Output Guide:

Waste emissions from a project should be within the assimilative capacity of the local environment to absorb without unacceptable degradation of its future waste absorptive capacity or other important services.

Input Guide:

Harvest rates of renewable resource inputs should be within regenerative capacity of the natural system that generates them; depletion rates of non-renewable resource inputs should be equal to the rate at which renewable substitutes are developed by human invention and investment.

Source: World Bank, 1991a, 52.

7.2.6 EA as a Sustainability Instrument

Widely institutionalized already, the EA process provides one of the keys for incorporating the principles and perspectives introduced above into development planning and decision-making. Some possible steps and measures to that end are reviewed here. Their order of discussion corresponds to a graduated approach to process development, beginning with immediate modifications to sharpen EA as a sustainability instrument and then considering how SEA can be extended to similar purpose. As well as being important in their own right, these steps can be seen as promoting and leading toward the emergence of a more comprehensive, integrated approach to sustainability assessment, planning, and policy making described in the next section.

In all cases, the measures proposed are generic and adopted or adapted from national and international practice. Whether and how EA is or can be used as a sustainability instrument within particular jurisdiction depends on a number of factors, including the orientation of public policy (e.g., does it approximate to weak or strong sustainability?). At the final review workshop of the effectiveness study, the steering committee stressed the importance of lifting standards of EA practice gradually and pragmatically toward sustainability assurance (see case studies in Folios). Specifically, new requirements should be cast in a positive "ready-to-use" framework to reflect political realities and economic circumstances. There was particular concern that developing countries should be able to see the advantage of using these to optimize the benefits of development.

7.2.7 Sharpening EIA to Sustainability Purpose

As presently institutionalized, EIA is primarily applied to minimize and mitigate, as far as possible, the adverse effects of projects and activities. The process is usually applied in accordance with the preventative principle rather than the precautionary principle, i.e., with the limited aim of avoiding reasonably known or predictable environmental impacts and risks rather than maintaining natural capital under conditions of uncertainty (where outcomes cannot be predicted with confidence or assigned a probability of occurrence). Recently, however, many governments and international organizations have endorsed the precautionary principle pursuant to the Rio Declaration (see Box 7.2), possibly without understanding its fundamental characteristics or intending to apply only a weak version that corresponds to preventative or no-regrets policy (see Young, 1993).

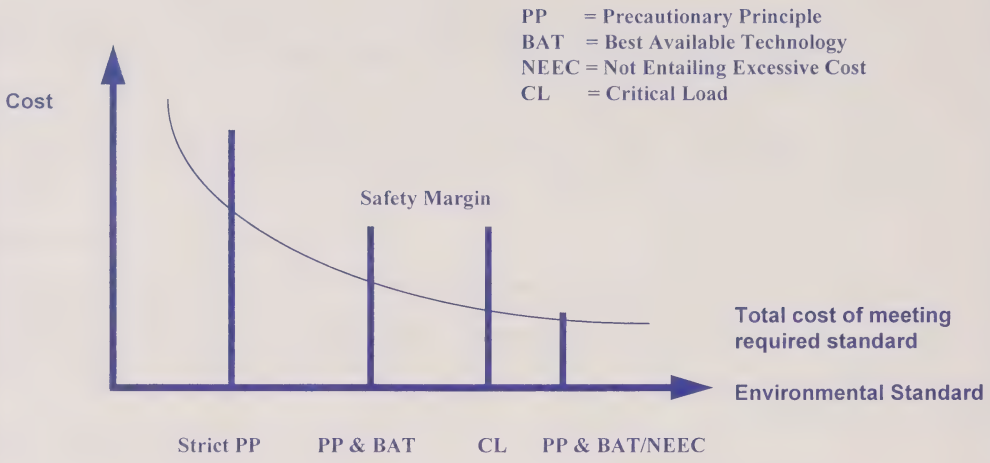
Box 7.2 Rio Declaration on the Environment and Development; Principle 15:

"In order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific uncertainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

Conceptually, and as set out in Figure 7.1, there are three operational interpretations of the precautionary principle:

- a strict form of the principle which advocates confinement within the realm of complete reversibility, and only allows discharge which has been shown to neither pose danger to an ecological system nor diminish environmental quality;
- a requirement that "risky" industries use the best available technology plus a precautionary safety margin which keeps ambient environmental concentrations significantly below initial load; and
- a weaker version that only requires the use of best available technology when this does not entail excessive cost (Ramchandani and Pearce, 1992).

Figure 7.1: Different Interpretations of the Precautionary Principle



Note, however, that in almost all cases, environmental standards consistent with the precautionary principle tend to be higher than those suggested by conventional cost benefit analysis. (Source Young, 1993, 15-16)

Comparing these three interpretations of the precautionary principle with the wording found in Australia's Inter-Governmental Agreement on the Environment, helps identify ways in which the principle and the concept of intergenerational equity can assist decision makers

- When the cost of degradation may be serious or appears irreversible and/or there is little prior experience or scientific confidence about the outcome -- follow the strict precautionary principle.
- When the cost of degradation may be serious but reversible, -- maintain a large safety margin and require use of best available technology.
- As confidence with the activity increases, allow a transition to arrangements that only require the use of best available technology when this does not entail excessive cost.
- When the threat of environmental damage or irreversible loss is neither irreversible nor perceived to be serious, use conventional cost benefit analysis.

Within this framework, three steps are proposed for sharpening EA as a sustainability instrument:

- (re)focus on environmental "bottom lines" with particular reference to environmental standards (e.g., within the margins identified in Figure 7.1);
- evaluate the "acceptability" of potential environmental effects against the composition and value of natural capital stock, paying particular attention to critical resources and ecological services; and
- require "in-kind compensation" for the residual impacts (i.e., that cannot be mitigated or avoided) for all acceptable development projects and activities.

Step 1: Stay within "source" and "sink" capacities

As Figure 7.1 illustrates, the establishment of a "safety margin", centered on critical loads, is crucial to using EIA to implement the precautionary principle for sustainability assurance of development activities. When estimating impacts, depending on the uncertainty and potential severity of adverse effects, sufficient latitude for error should be left as a hedge or safeguard against irreversible, unacceptable or serious loss or change to resources and ecosystems[1]. This means that environmental standards or comparable thresholds or capacities are necessary if the EIA process is to be used for sustainability assurance. Usually, these are set through policy, regulatory, and planning processes that lie outside the EIA system. A first step is to identify the availability and scope of environmental standards or other relevant guidelines, recognizing that national frameworks differ in this regard.

From a sustainability perspective, the capacity of environmental sinks to absorb pollution and wastes is recognized as more limiting than the depletion of natural resources. In the case of renewable resources, of course, source and sink functions are interconnected. The effects of air, water, and soil pollution include the impairment of productivity and regenerative capacity.

Assimilative thresholds can take a number of statutory and non-statutory forms: ambient standards for air, water, and noise; emission levels or ceilings for solids, effluents, and toxins; and various environmental quality objectives and management guidelines. Many countries have national sustainable development strategies in place and, in some cases, these include specific targets and timeframes for reducing pollution loading (see Folio 7.3). Often, existing environmental and health standards, placed in the context of sustainability, can be sufficient to determine critical loading in the case of projects in which discharges of persistent toxic contaminants or other measurable emissions are the primary impact. The Alberta-Pacific Pulp Mill review in Canada is a case example (see Folio 7.4).

[1] This rule is also consistent with (and extended by) the widely accepted notion of adaptive environmental assessment and management (Holling, *et al.*, 1978) and with more recent ecological concepts, such as minimalist systems theory (see Costanza, *et al.*, 1992). An adaptive approach involves designing for uncertainty, proceeding carefully by identifying restraints, expecting the unexpected, monitoring and ex-post evaluation, and learning from experience. "Minimalist" strategies focus on hierarchical levels, processes, and variables that affect landscape change, and that are relevant to managing toward ecological integrity and health.

National policy and regulatory frameworks appear to be more patchwork and less concrete in setting ecological thresholds against which to assess site, linear (infrastructure), and large-scale resource developments that involve spatial or area-wide effects, such as loss or fragmentation of wildlife habitat or other forms of resource depletion and deterioration. Where policy-planning guidelines are well developed, as in the UK and the Netherlands, they help provide an integrated perspective on the potential consequences of land use conversion and landscape alteration. Other sources of such insights include green plans, sustainability strategies, and equivalent processes (e.g., local Agenda 21s) which identify reference points and norms for ecologically sustainable development (e.g., conservation of biodiversity). Up to a point, there is a richer overlay of practical guidance on the conduct of EA for sustainability assurance than is possibly realized. However, it needs to be systematically assembled and organized for this purpose, and augmented by additional criteria that help gauge ecosystem integrity and other "vital signs" of sustainability.

A considerable body of research is currently taking place on this latter area. The Enquete Commission of the German Bundstag (1994), for example, has identified impact assessment criteria for ecological integrity and health and related these to reference thresholds and limits for impact evaluation. It has proven especially difficult, as the Enquete Commission acknowledges, to specify criteria for biotic processes. Further progress on this front can be expected. The immediate requirement, from an EIA perspective, is to incorporate sustainability indicators into screening, scoping, and significance guidance (see also UK Department of the Environment, 1996).

Step 2: For critical and high value environmental functions and areas, undertake a full-cost analysis of natural capital stock to determine impact acceptability

An indication that critical loading may be exceeded or that potentially significant impacts are likely to occur as a result of development proposals is currently a trigger for the application of a comprehensive EIA study. In one sense, building a more systematic framework of standards, criteria, and indicators can be seen as part and parcel of process development. However, their use for sustainability assurance, consistent with the precautionary rules outlined in Figure 7.3, adds a more stringent dimension to the EIA process. This becomes evident when development projects and activities are proposed for high value resources and ecosystems, which are unique, rare, limited in supply, and/or serve important production, regulation, and/or conservation functions. Under these conditions, the application of the precautionary principle does not mean that all development with uncertain consequences and/or possibly major impacts are automatically unacceptable. But it does mean that these should be subject to "full-cost" assessment including a comparison with the total economic value of maintaining the resource base in its current state (i.e., a functional evaluation of the no action alternative).

This approach corresponds to a generalized safe minimum standards (SMS) requirement. As applied in economics, the SMS "rule" states that potentially irreversible environmental losses should be avoided unless it can be demonstrated that the social cost is unacceptably large. In other words, the presumption is for protection rather than development and the onus of proof is reversed with regard to impact acceptability (i.e., proponents must show potential damages are within safety margins or the benefits foregone are excessive). By definition, the generalized

SMS approach is restricted to a certain limited class of development projects and activities that potentially affect critical loading and resources. These conditions for the application of SMS will be imprecise (because of uncertainty) and open to interpretation and argument. However, the principle of not liquidating critical natural capital is widely accepted by world industry (e.g., Schmidheiny, 1992; Willums and Goluke, 1992), as well as by all governments and international agencies that endorsed the Agenda 21 and other Rio conventions.

In practice, the analytical frameworks for full-cost comparison of what is gained and what is lost by development projects are not yet well developed. A wide range of values are associated with natural resources and ecosystems and their alternative uses (even when simplified to discrete development vs. protection choices). To date, relatively few examples are available of practical, policy-applicable approaches. The experience of the Australian Resource Assessment Commission (1989-1993) is instructive (Folio 7.5). It indicates that resource use and option values can be considered within an extended loss-benefit framework, which incorporates benefit-cost analysis, EIA,and SIA. Explicit recognition is also given to the need for dealing cautiously with risk and uncertainty, using various techniques for analysis and mechanisms for checking and verifying information as part of an impartial, open public inquiry process (see Palmer, 1992).

Other comparable case examples of projects subject to environmental review include:

- the New World mine in the Greater Yellowstone bioregion (Folio 7.6); and
- the West Castle resort on "Crown of the Continent" ecosystem, Canada (Folio 7.7).

Step 3: *Apply in-kind compensation for all residual impacts to meet the no net loss rule*

All other non-critical environmental losses can be compensated for by various arrangements for in-kind compensation for residual impacts, i.e., those remaining after mitigation. On an aggregate level, environmental sustainability is equated with the maintenance of natural capital, i.e., keeping resources, stocks, and ecological processes more or less at their present levels. The premise here is that, world-wide, the availability of natural capital has become limited and is limiting on development. Many ecological economists and others argue that natural capital now must be treated and valued as a separate component in the production process, one that is complementary to, rather than freely substitutable by, man-made capital. The application of "the no net loss" principle is consistent with and exemplifies the weaker version of the precautionary principle described earlier.

No net-loss principles can be met in EIA and SEA processes by specifying a straightforward, but far reaching mitigation requirement for "full" impact compensation (Sadler, 1995,). In effect, non-critical resource losses and environmental deterioration occurring as a result of development must be matched or offset by a reasonably equivalent (like-for-like) package of ecological gains and benefits. The principles of no net loss are already instilled for fish and wildlife management, for example, in the US and Canada.

Based on an impact damage assessment, several compensation goals can be identified. These can be precisely expressed for fish and wildlife habitat units and species, but here are generalized as:

- *in-full (no trade-off)* to identically offset high value loss incurred, e.g., for key species or wetland functions;
- *equal replacement* to generally offset the high-medium value loss, e.g., so that habitat units can be traded across important species;
- *relative replacement* for medium value loss to ensure other types of habitat or wetland functions are improved or rehabilitated in areas of concern; and
- *flexible trading* to compensate for low value loss of abundant resources or where there is no equivalency, e.g., carbon sequestering for CO_2 emissions.

Undoubtedly, this type of asset-trading and replacement will be crude and imprecise. As such, impact compensation will need to be promoted and implemented pragmatically. This might be seen as an onerous requirement on development. However, it is one that is fully in keeping with the "polluter pays" principle that business and industry already accept. Because maintenance of natural capital is an aggregate yardstick of environmental sustainability, it does not translate into zero environmental damage for specific policies, plans, projects or programmes -- which would have the effect of stultifying necessary development. The no net loss principle does, however, demand that a "good faith" best effort be made to replace or offset as far as possible what is lost, and to ensure that the environmental capacities at or near current levels of baselines are maintained.

The EA process, as a primary instrument for development planning and decision making, can serve as a crucial action mechanism for sustainable development. Now that cumulative and large-scale effects are a pervasive feature of development, it is time to reconsider the prevailing approach to impact minimization. Otherwise, we risk irreversible or structural changes, which by definition cannot be compensated, restored or otherwise offset (except through long-term natural recovery). In this context, there will be considerable scope for the creative application of impact compensation and offsets via resource conservation, rehabilitation or enhancement measures.

This approach will be particularly relevant at the policy, plan, and programme level, and opens the door to the use of SEA to positively shape development by:

- screening economic and development policies for their conformity with environmental sustainability targets as set out in national policy or strategy;
- preliminary assessment of development proposals to identify low-impact, resource-efficient alternatives (e.g., for energy, transportation, etc.);
- more detailed sectoral assessment to identify an in-kind compensation package to offset potential cumulative effects; and
- regional assessment to clarify safe minimum standards for managing the cumulative effects of development, e.g., on resource values, land use capabilities, ecological integrity, and biodiversity.

7.3 Applications to Global Change

Global change refers to changes in the atmosphere, oceans, biosphere, climate, and other major components of the earth's physical systems as a result of natural causes and human activities. Many scientists consider that human activities are now on par with or may even surpass natural processes as an agent of planetary change (e.g., Silver, 1990).

The full agenda of global change issues is outlined in Box 7.3. Biodiversity loss and climate warming are, perhaps, the most pressing and serious sustainability issues that now confront society. In this regard, it is realistic to ask whether and how EA might help address them as part of the agenda of national and international policy response.

Under the UN conventions on climate change and biological diversity, EA is identified as one mechanism for implementation. The use of EA has the advantage of providing a well-established process and "entry point" for incorporating these issues into the mainstream of development planning and decision making. However, incorporating global change considerations into EA will require a possibly significant extension to process scope and application. With certain exceptions, it is not yet clear how countries that are signatory to the conventions are responding to this additional requirement.[1] An immediate start can be made by making a relatively limited set of adaptations and modifications to the EA process, and then using these to build a more integrated approach including linkages to other policy instruments.

7.3.1 Science, Policy and Assessment

Understanding and responding to global change is difficult for a number of reasons.

- *Global change issues are complex and many-sided*; they are characterized by large-scale alterations to natural cycles and components of the earth system that operate together (e.g., atmosphere dynamics, ocean circulation and climate regime).
- *A combination of driving forces are responsible*; including high per capita consumption and use of natural resources by industrial countries, and exponential population growth and widespread poverty in many developing countries.
- *The environmental impacts and socio-economic consequences are uncertain*; much remains unknown about the processes and interactions that govern global change, and cause and effect are hard to disentangle.
- *Coherent policy response to global change demands an unprecedented range of measures and level of international cooperation*; this will be difficult to achieve, even with mounting evidence of risks and impacts, because of differences in value frameworks and modes of behavior in coping with uncertainty.

[1] It is worth noting that the World Bank has stated that it will not finance projects that contravene these and other international agreements to which the country concerned is a party, and that ratification of the biodiversity and climate change conventions can be a prerequisite for financing through the Global Environmental Facility (GEF).

Box 7.3 The Basic Structure of Global Change

Atmosphere
- intensification of the greenhouse effect
- ozone depletion in the stratosphere
- changes in the troposphere (photochemical, smog, acid rain)

Biosphere
- forests: removal, loss of diversity, increased susceptibility to fire, trace gases feedback
- grasslands and farmlands: loss of diversity, soil and runoff changes, encouragement of pests
- drastic reduction in coastal vegetation
- pelagic and benthic biomass: changes in community structure

Climate Change
- Global surface warming +3^{0}C by 2050 -- greatest (<+8^{0}C) in sub-arctic winters
- redistribution of precipitation
- rise of sea level (non-tectonic) of 65 ±cm by 2100

Human Population
- net increase of 100 million per year, mostly in subtropics
- increased urbanization, especially growth of mega-cities
- local concentration of chemicals, refined materials, wastes; regional drawdown of fertility by 2100
- increased encouragement for new parasites and viruses

Hydrosphere
- horizontal and vertical changes of ocean circulation-- weaker Gulf Stream, stronger Kuroshiro
- changes in Antarctic and Greenland icecaps
- changes in flood regimes, sedimentation/erosion, delivery of pollutants
- changes in groundwater and recharge (quantity and quality)

Economy, Energy and Transport
- regional and global economic linkages increasingly prevent self-correcting feedbacks to balance resources or ecological deterioration
- increased use of high-quality energy and long-distance transport of organic products and chemicals is a major global change
- regional 60 Hz electrical fields on all continents except Antarctica

Lithosphere and Pedosphere
- increased erosion, material redistribution
- reduction of organic content of soils
- widespread breakdown of soil structure, due to forest changes and cultivation
- increased nutrient mobility and loss due to use of soluble fertilizers

Social Factors
- mismatch between causes by humans, effect on humans and human responses
- economic and cultural obstacles to "environmental consciousness" in society
- inability of individuals to be convinced of the magnitude of the problem
- breakdown of "inter-generational contract" that controlled most behavior in all cultures until the 20th century

Source: German Advisory Council on Global Change, 1994.

Given these circumstances, the application of the precautionary principle is widely accepted as the best policy and institutional foundation for responding to global change. This approach recognizes that politicians are hard-pressed to take action against unprecedented and possible irreversible damage, but lack firm (or irrefutable) scientific evidence on which to base their choice. EA serves as a critical bridging mechanism between science and policy. As shown in Box 7.4, the practice of EA has both important similarities and differences to the science of global change, based on large-scale models (Roots, 1995).

The closer linkage of these "bottom-up" and "top-down" approaches can have reciprocal benefits. First and foremost, EA of specific development proposals needs to take account of the potential modifications or additional uncertainties introduced by global change. The reference point for prediction and mitigation of cumulative effects may not be so much what environmental baseline and biodiversity conditions are, as what they might become (i.e., the kinds of changes listed in Box 7.4). However, this is easier said than done. There are significant variations in confidence levels with respect to prediction, e.g., for ecological versus physical impacts. An adaptive approach, recognizing that the future is likely to be non-linear, is a useful adjunct to the precautionary principle. The International Joint Commission (1987) used this strategy to address the implications of climate change in its reference study of Great Lakes Water Levels and Diversion Projects (see Folio 7.8).

In this context, EA can be used to examine various dimensions of global change issues, drawing on the best available information from large-scale modeling of system dynamics. A set of approaches may be identified with a focus on:

- *regional impacts of global change*, e.g., on biodiversity, water resources, aquatic systems, fish species;
- *the impacts of development proposals on global change*, e.g., CO_2 and greenhouse gas emissions in relation to energy facilities and alternatives; and
- *the impacts of mitigation measures* designed to counter or offset global change, e.g., to ensure one form of damage is not simply traded for another (such as SO_2 for CO_2 emissions in flue gas technology).

"A quick start" agenda for applying EA with regard to global change issues can be built on the existing processes. This involves:

- taking the UN conventions on climate change and biological diversity as policy references and legal commitments (for signatory countries);
- developing national guidance and interpretation as to the use of EA as an implementing mechanism;
- using existing methods and procedures to the fullest extent possible;
- building more integrative approaches as required; and
- recognizing the specific and differentiated problems and policy characteristics of biodiversity and climate change in process design and application.

Box 7.4 Environmental Assessment and Global Change Science -- Differences and Similarities

Differences:

Scale:	EA as commonly practiced, deals with a limited range of activities and impacts; global change studies explore the complex interrelation of natural cycles and processes and human-caused changes.
Approach:	global change studies are "top-down", assembling information on net change and investigating what activities and processes combine to produce observed or forecasted effects; EA addresses global change from the "bottom-up" looking at the overall effect of specific projects and policy proposals.
Purpose:	EA is intended to reduce the impact of proposed plans, decisions, and actions and does not (usually) challenge the policy and institutional goals; global change studies are intended to increase understanding rather than indicate actions to be taken.

Similarities:

Information:	both EA and global change studies require the best possible information about natural processes, environmental conditions, and response to stress.
Time Scales/Factors:	both deal with larger timeframes and consider the effects of a wider range of factors than ordinarily taken into account in public policy making or business planning.
Spatial Scale:	both require the ability to relate information from small to large scales, although the perspectives, methods of observation, data systems and models, and extrapolations will differ widely.

Source: Roots, 1995, 3-4.

7.3.2 A Framework Approach to Climate Change

From the standpoint of EA, climate change may be seen as a problem of large-scale, cumulative effects. It is the compound result of countless actions and emissions of CO_2 and other greenhouse gases overtaxing the atmosphere as a carbon sink (setting aside important linkages to ocean circulation and plant absorption). The challenge is how to address the key issues, while recognizing that:

- for regional impacts of climate change, there are significant uncertainties related to ecological prediction, e.g., vegetation cover, compared to global physical prediction, e.g., mean surface warming and mean precipitation increase;
- with regard to the effects of specific development proposals on climate change, there is an asymmetry of source-sink relationships, so that even the largest coal-fired generating plant adds only a fractional percentage of global CO_2 emissions; and

- in assessing mitigation measures to combat climate change, there are different geographical and sectoral distributions of benefits and costs ,e.g., food production could increase substantially in some areas and decline in others.

Framework Convention on Climate Change

An approach to placing these issues in a policy context to focus assessment begins with the UN Framework Convention on Climate Change. The basic objective, consistent with the precautionary principle, is to stabilize "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-caused) interferences with the climate system". Elaborations of the precautionary principle with respect to climate change include (Expert Panel on Canadian Options for Greenhouse Gas Emission Reduction, 1994):

- focus on long-term energy efficiencies which represent the biggest single area for greenhouse gas emissions reduction (e.g., identify through screening and scoping);
- undertake resource management actions to "offset" emissions, such as reforestation initiatives to increase CO_2 sinks (e.g., specify as a requirement for impact mitigation);
- look for cost-effective, "no regrets" measures that are worth doing anyway (e.g., targets in examination of alternatives); and
- prepare for the possibility that new scientific information will require nations to act more quickly (e.g., by global and regional assessments of impacts of climate warming).

The convention, which came into force in 1994, does not set firm targets and schedules for reducing greenhouse gases. A possible exception (it is varyingly interpreted) is Article 4 which refers to the aim of stabilizing greenhouse gas emissions from the industrial world to their 1990 levels by the year 2000. Meeting these levels, which appears far from certain, likely will not be enough to halt the growth in atmospheric concentrations of greenhouse gases, nor, in turn, to slow the pace of climate change (Intergovernmental Panel on Climate Change). At the 1995 Berlin conference, the Parties to the Convention recognized that current progress was inadequate and began a further round of negotiations.

In accordance with Article 4, the industrial countries should report on progress toward stabilization. The Parties to the Convention are also to develop "national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases" and to formulate "national and regional programmes to deal with climate change". Relevant policies and actions are to take account of climate change to "the extent feasible". In this regard, impact assessment is cited as an appropriate method to minimize adverse economic, social, and environmental effects of projects to mitigate or adapt to climate change.

National Guidance and Requirements

To date, few EA agencies appear to have established procedures or provided explicit guidance with respect to addressing climate warming and other global changes. Possibly the first to do so was the US Council on Environmental Quality (CEQ, 1989). This was pursuant to basic NEPA advice on:

- *environmental effects abroad of major federal actions*, which, *inter alia*, requires the preparation of an EIS where there are significant effects "on the global commons outside the jurisdiction of any nation"; and
- *CEQ regulations for addressing cumulative impacts*, which require agencies to consider "the incremental impact of an action when added to past, present or reasonably foreseeable future actions" (Section 1508).

With respect to NEPA guidance documents, CEQ (1989) advised agencies to consider global warming and stratospheric ozone depletion to be "reasonably foreseeable". It also asked them to consider the effects of agency actions on global change and vice versa. The draft guidance noted that it was not CEQ's intent to suggest that global climate change should be emphasized over other environmental effects, or that any emissions of a greenhouse gases would trigger EIS. Finally, CEQ pointed federal agencies toward the consideration of global climate change at the programme level, noting that project level EIA "would not provide meaningful information in most instances".

Strategic Environmental Assessment (SEA)

As described in Chapter 6, SEA of policies, plans, and programmes is now undertaken by a number of countries. This level of analysis permits a more effective assessment of the implications of development decision-making for climate change. SEAs can serve as an "early warning" mechanism, where policies, plans, and programmes will initiate major CO_2-emitting projects and activities or have implications for this area. In this regard, policy and programme assessments of energy and transportation proposals provide key opportunities to anticipate greenhouse gas emissions and examine alternatives with a view to securing reductions in accordance with national plans and strategies (as required by Article 12 of the Framework Convention). The priority for "end uses" might be to review regional and municipal plans to identify the energy efficiency of the built environment and transport corridors, and identify options for combining carbon sequestering with amenity planning and retention of green space and habitat.

From this standpoint, the UK approach to environmental appraisal is of interest. Policy appraisals have included reviews of measures, options, and costs of a national programme to reduce CO_2 emissions by 10mtC by 2000 (UK Department of the Environment, 1993). Guidance on environmental appraisal for development plans prepared by local authorities also incorporates a sustainability "test". This identifies five dimensions of global sustainability as part of a 15-component checklist of environmental impact criteria. Plan evaluation is undertaken in three main steps:

- defining environmental "stock" of a region;
- scoping to define and check the environmental issues which require particular attention to planning; and
- apply the policy impact matrix to ensure consistency/compatibility with national objectives (e.g., UK sustainability strategy).

Project EIA

When tiered to an SEA along the lines described above, climate-warming considerations in project EIA come into sharper perspective. The focus at this point in the decision process would turn to project design (e.g., to improve energy efficiencies) and to impact mitigation via offsets (e.g., strengthening CO_2 sinks). Even without SEA (which is likely to be the case most of the time) these measures, together with an examination of lower impact alternatives, yield a means of using project EIA to meet national policy commitments to combat climate warming. As an across-the-board process, applied to all major greenhouse gas emitting projects, EIA will help to secure both "source efficiencies" and "sink top-ups". While individually small, these steps collectively could amount to a significant "hold-back" of emission levels.

Minor additions and adjustment to the EIA process can better focus consideration of large-scale, global effects. These include:

- *screening list* of activities resulting in greenhouse gas emissions;
- *scoping* to identify potential cumulative effects via interaction with other existing or proposed activities;
- *examination of alternatives* to include lower impact actions;
- inclusion of sector CO_2 and other greenhouse gas stabilization targets as criteria *for determining impact significance* and offset requirements; and
- explicitly requiring *mitigation* to include equivalent offsets for projected emission levels.

The consideration of climate-warming issues in project EIA (and SEA for that matter) would be much enhanced under a regulatory limit on CO_2 and other greenhouse gas emissions. For industrial countries, the commitment to stabilize emissions at 1990 levels by the year 2000 may be inferred as a national "cap" or overall limit. However, this has no force at present, and further developments in this regard are conditional on progress made on the renegotiation of the terms of the Framework Convention on Climate Change. Under a national "cap", a more creative range of impact assessment and mitigation activities will be possible. These are exemplified by the use of economic incentives under the emission "bubbles" already in place for regional airsheds in the USA and include[1]: use of tradable permits, provisions for "impact banking", and the requirement for performance bonds to guarantee compliance.

[1] Other economic policy instruments that may be applied to stabilize greenhouse gas emissions under a national "cap" include: natural capital depletion tax (in which the cost of damage is reflected in the price of products), and ecological tariffs (so that countries or trade blocs impose a charge on imports from countries where polluter-pays and depletion taxes are not applied)

7.3.3 *A Framework Approach to Biological Diversity*

Under the Convention on Biological Diversity, scientific and policy concerns focus on three basic components (see Box 7.5):

- fragmentation and degradation of large-scale ecosystems and communities of life (e.g., tropical forests);
- extinct and threatened plant and animal species (e.g., decline of frogs and other amphibians); and
- reduction of genetic variations within species (possibly at a greater rate than species extinction).

Each Party ratifying the Convention is required to develop (or modify) national strategies, plans or programmes for the conservation and sustainable use of biological resources. Under Article 7, each Signatory is also required "as far as possible and appropriate", to identify and monitor important components of biodiversity and activities that are likely to significantly affect these. In article 14, implementation mechanisms are outlined, including "environmental impact assessment of proposed projects likely to have significant adverse effects on biodiversity".

Implicitly and explicitly, biodiversity considerations are addressed already in EA. However, the attention given to components varies. For example, identification of rare, threatened, and endangered species is a well established focal point for impact analysis and evaluation. Ecosystem and landscape-level changes, such as wetland and habitat loss, also provide a familiar context within which to undertake project-level EIA. To date, however, little attention appears to have been given to intra-species genetic diversity -- which is critical to plant and animal survival and adaptability under different or changing environmental conditions. Whether and how this component can be referenced in EA requires specialized advice.[2]

Biodiversity issues call for widened perspective on the application of EA. Many of the constituent terms, such as ecosystem integrity and health, are not so much new as they are difficult to precisely define and operationalize in practice. It is important to factor biodiversity considerations into EA frameworks and processes, entrenching and adjusting them as necessary. The first step involves addressing the components of biodiversity and the range of scales at which impacts can be assessed (e.g., localities, ecosystems, biomes). An initial frame of reference, incorporating international agreements and emerging policy and practice among leading countries, is outlined below.

[2] In principle, addressing the first two problems, i.e., reduction of ecosystem and population diversity, might be expected to substantially cover gene pool considerations. However, there is evidence that genetic variation is being lost as a faster rate than simply through extinction.

Box 7.5: Human Impacts on Biological Diversity

- 1.4 million species have been identified
- less than 5% are mammals, birds and plants
- 100 invertebrates are lost daily
- 1 bird, mammal or plant is lost each day
- three-quarters of all bird species are declining in population
- virtually all wild cats and most bears are declining seriously in numbers
- more than two-thirds of primates are threatened with extinction

Law, Policy, and Guidance

Most national EA frameworks appear to provide a statutory basis for governments to meet the requirement of Article 14 of the Convention. Although biodiversity may not be mentioned explicitly, the reference is usually implied or encompassed in their wording, e.g., in objectives, definitions of environment, and scope of consideration of environmental impacts. The *Canadian Environmental Assessment Act*, for example, refers to: "actions that promote sustainable development" (ss 4[b]), and defines factors to be taken into account in identifying environmental effects as including "the capacity of renewable resources...to meet the needs of the present and those of the future".

Guidance on the incorporation of biodiversity considerations in the NEPA process has been issued by the US CEQ (1993). This document, *inter alia*, identifies:

- current weaknesses in NEPA process with respect to biodiversity (e.g., inadequate consideration given to "non-listed" species and non-protected areas);
- basic recommendations for agency improvements in addressing these (e.g., clear acknowledgment of biodiversity as a national policy, better gathering, assembly, and exchange of information); and
- key factors contributing to biodiversity reduction in the USA; these are also relevant to other countries and constitute cardinal ecological references points for biodiversity related assessments (Box 7.6).

Other countries are in the process of drafting guidance and supporting material on EA and biodiversity. The Canadian reference guide is of interest because it is cross-referenced to a national action plan as required by Article 12 of the convention and identifies strategic directions for EA (Government of Canada, 1995). The Canadian strategy notes that often potentially adverse impacts of development activity on biodiversity can be effectively assessed by applying "simplified procedures". In other cases, more integrative ecosystem-based approaches, merging EIA and land use planning are required, particularly to address cumulative effects.

Box 7.6 Factors Contributing to the Decline of Biodiversity

For purposes of impact assessment, key cause-effect relationships are:

- *physical alteration* as a result of resource and land conversion to more intensive uses causes habitat destruction, fragmentation, and simplification
- *pollution* from all sources can have immediate, direct, and cumulative indirect effects on species and on habitats
- *over-harvesting* of fish, wildlife, and other plant and animal species can reduce target populations below levels at which they can recover or indirectly affect other species with which they interact
- *introduction of exotic species* can lead to elimination of natural species through perdition, competition, genetic modification, and disease transmission
- *disruption of natural processes* by intensive resource management activities may alter ecosystem dynamics with further effects on community composition and succession
- *global climate change*, if realized, means that many species and ecosystems would not be able to function in their natural ranges, and plants and animals attempting to adapt would face rates of change many times that needed to evolve

Source: US Council on Environmental Quality, 1993, 2-3.

Simple, Value-Added Modifications to EA

In the first instance, biodiversity considerations can be built into the existing EA process by the elaboration of certain principles and criteria, supported by minor procedural adjustments. The following guidance is based primarily on:

- materials prepared for and modified at a workshop held by the Biodiversity Convention Office, Environment Canada (Sadler, 1994); and
- a related reference guide prepared by the Canadian Environmental Assessment Agency (1996).

Objective: With reference to biodiversity, EA is applied to ensure that development proposals do not significantly reduce the variability among and within living species and organisms, including the ecosystems and communities of which they are part. The onus is on proponents to demonstrate that this is the case and that all reasonable steps and measures have been taken to mitigate or otherwise compensate for any impacts identified, including possible cumulative effects.

Principles: Several principles can help development proponents take better account of biodiversity considerations when undertaking assessments:

- apply a synoptic or ecosystem perspective;

- identify unique, rare ecologically sensitive areas and important patterns and interconnections (e.g., wildlife corridors);
- avoid or minimize the impact on these features through location, design, and mitigation measures;
- ensure that exotic or non-native species are not introduced;
- determine that the sustainable use of natural and living resources will not be compromised; and
- prepare impact compensation and rehabilitation plans for unavoidable damages in accordance with the no-net-loss criterion:
  - have limited or minimal impact on or risk for biodiversity ecosystem, population, genetic diversity;
  - apply the precautionary principle to avoid losses; and
  - promote (or at least not undermine) sustainable use of biological resources.

Application of procedures: The following questions can help establish the need for modifications to process and guidance:

- *screening*--are activity lists or criteria sufficient to trigger consideration of important biodiversity issues?, e.g., agricultural and forest development, species variety;.
- *scoping*--do guidelines specify appropriate time and space boundaries for analyzing proposals?, e.g., ecosystem and landscape level context;
- *impact analysis*--are requirements adequate to identify potential biodiversity effects of development proposals?, e.g., whether an affected species is at the limit of its geographic range;
- *mitigation*--do provisions cover the full range of biodiversity maintenance or offset strategies?, e.g., covering maintenance or recreation of "edge effects" and "patch dynamics"; and
- *evaluation of significance*--are criteria and guidelines relevant to determining the acceptability of impacts on ecosystem, species, and, possibly, genetic biodiversity?, e.g., relative value indicators for non-listed species.

Elements of approach: Integrating biodiversity considerations into the EA process will require two interrelated types of examination. Where cumulative effects are identified as a concern or for large-scale development proposals, baseline studies may include a strategic or area-wide assessment of biodiversity. This will possibly include a characterization of a landscape, ecosystem or locality including community associations and spatial relationships. Key concerns will be to identify:

- unique and significant biodiversity features;
- main threats and stresses being placed on these; and
- the components most at risk with possible strategies for their conservation (see Folio 7.9).

Such analyses will materially assist assessment of the impact of specific proposals on biodiversity components. A matrix for analysis of biodiversity impacts is outlined in Figure 7.5. This relates the main factors to be considered with regard to biodiversity against the key components and scales for review. In identifying the potential impacts of a proposal on

biodiversity, a range of questions may need to be addressed, including some which may be additional to those normally considered in screening, scoping or other EIS steps and activities.

Figure 7.5: Matrix for Analysis of Biodiversity through the EIA Process

Factors to be considered	A. Ecological Functions	B. Ecosystem	C. Species and Populations	D. Genetic Pool
1 Area of high diversity				
2 Large numbers of endemic species				
3 Threatened species				
4 Wilderness area				
5 Area required by migratory species				
6 Unique area				
7 Representative area				
8 Biological keystones				

Data and Methods: An assessment of the potential biodiversity-related effects of a proposed activity requires the use of relevant concepts, measures and indicators. These can be drawn, for example, from landscape ecology, conservation biology and related fields. Habitat-based methods, for example, provide some structured and tested means of biodiversity impact assessment (for a comparative review, see Canter, 1995). Species abundance and diversity is considered a function of availability and quality (carrying capacity) of its natural habitat, and the focus is on retention of basic characteristics (size, pattern, corridors). By using GIS and other methods, for example, impact prediction can target sensitive or other at-risk species (see Folio 7.2).

In many cases, however, this level of analysis may not be warranted or possible. The use of basic EIA methods, such as checklists, matrices, overlays, and network analysis, can be overly-helpful. However, special care needs to be taken to avoid a "mechanical" analysis, recognizing that biodiversity considerations are complex and multi-dimensional. Often, the availability of information on biodiversity aspects can be expected to be constraining, as noted for example, in the Canadian Biodiversity Strategy. In such cases, a combination of surrogate and inferred information, scientific consultation, and traditional ecological knowledge can be used, e.g., to identify indicator species or valued ecosystem components to better focus impact analysis.

Where warranted, requirements for "biodiversity monitoring" and impact management can form part of approvals of projects and activities. More cost-effective, reliable, and local-scale methods of baseline and effects monitoring of the presence, abundance, and diversity of species are widely acknowledged as important, e.g., for comparing pre- and post-project conditions, and for determining the success of mitigation measures. One recently developed tool for this purpose is an automated intelligent monitoring system (AIMS), that uses audio and environmental receptors to record bird and amphibian populations. In combination with GIS methods, the AIMS technology reportedly provides (Patrick, *et al.*, n.d.) locations of species in space, definition of habitat and area requirements, and detailing of spatial associations and responses to environmental change over time.

Summing Up: A step-by-step approach to incorporating biodiversity considerations is outlined below. The main point to note is that this does not require additional steps or major new activities as part of the EA process. What it calls for primarily is the application of appropriate time-space frameworks, attention to cumulative effects, and identification of optimal ecological processes and relationships. These are or should be already part of EA "good practice".

The following EA steps are important with respect to biodiversity considerations:

- establishing the impact zone and ecosystem context;
- identifying the issues and factors of concern and the ecological objectives for managing them;
- data gathering and understanding baseline conditions;
- identifying biodiversity effects and elements at risk; and
- establishing mitigation objectives and measures.

The following additional monitoring-specific steps can build on these elements:

- select indicators;
- identify control areas/treatments;
- design and implement monitoring;
- confirm relationships between indicators and goals and objectives; and
- analyze trends and recommend changes to management.

Toward an Ecosystem Approach

For the longer term, the application of a regional ecosystem approach will be necessary to fully address biodiversity considerations. Potential concepts, tools, and methods for application include:

- the gap analysis project undertaken by the US Fish and Wildlife Service;
- the work of the International Joint Commission in identifying ecological "hot spots" in the Great Lakes Basin;
- the "critical areas" methodology provided by the Canadian Global Change programme; and
- recent developments in synoptic, landscape-level approaches to identify cumulative effects (e.g., by Environment Canada, US Environmental Protection Agency).

Case applications of ecosystem and strategic level approaches include:

- *Nature Conservancy Project on Great Lakes Biodiversity*. This comprises a regional assessment of biodiversity; it identifies key components for the entire basin, evaluates human activities that put these at risk, and outlines opportunities for protection (see Folio 7.9); and

- *Programmatic EIS for Bridge Crossings on the US-Mexico Border*. This exemplifies an assessment of the impact on biodiversity of infrastructure development that is likely to initiate a range of ancillary projects and activities with the potential for cumulative effects; it will include an analysis of the unique features of the Rio Grande River basin and responds to the dual mandate of NAFTA for expanded development and protection of ecosystems (see Folio 7.10).

7.4 Key Points: Summing Up This Chapter

Key sustainability principles include:

- *precautionary principle* -- err on the side of conservation as a hedge against irreversible or highly damaging changes;
- "*anticipate and prevent*" -- a much cheaper and less risky approval than react and cure;
- *stay within source and sink constraints* -- resource use/harvest within regenerative capacity; pollution/waste output within assimilative capacity;
- *maintain natural capital at or near current levels* -- no aggregate/net loss or drawdown of resource stocks or ecological diversity;
- as far as possible, *avoid conversion of land use from less intensive to more intensive uses;* and
- *polluter-pays principle* -- full costs for environmental damage must be borne by users, e.g., industry and consumers.

EA as a sustainability mechanism: It is important to recognize that EA is only one policy instrument for sustainability. A comprehensive approach to maintaining ecological assets encompasses protected areas and maintenance of habitat ("12% set-aside rule") and rehabilitation of damaged and degraded areas, as well as full cost analysis (FCA) of development activities. EA, linked with other policy and planning instruments, can be applied in support of all three strategies.

Toward Full Cost Analysis: To promote the use of EA as "sustainability assurance" rather than an "impact minimization" tool, the following reinforcing adjustments to EIA and SEA appear to be needed:

- inclusion of sustainability principles in formal guidance or "best practice" advice;
- upgrading impact significance criteria and indicators with a view to establishing "safe minimum standards" for maintenance of critical ecosystem and habitat functions, biotic

integrity, keystone associations, i.e., in addition to reference to rare or threatened species, valued, sensitive or heritage areas, etc.; and
- full impact compensation ("like-for-like") to offset unavoidable residual losses after mitigation.

Impact compensation to maintain natural capital: This rule means that all resource losses and environmental damages occurring as a result of development actions must be fully offset by other measures. Depending on the relative significance of the loss/change, different types of compensation packages, with different trade-off configurations, might be negotiated, e.g:

- *in-kind* -- what is taken must be "duplicated" by an identical offset;
- *equivalent* -- what is taken must be replaced by an equal ("same resource") gain; and
- *comparable* -- what is taken must be offset by a relational input.

"*A quick start" agenda for applying EA to global change*: Build on the existing process to address global change issues by:

- taking the UN conventions on climate change and biological diversity as policy references and legal commitments (for signatory countries);
- developing national guidance and interpretation as to the use of EA as an implementing mechanism;
- using existing methods and procedures to the fullest extent possible;
- building more integrative approaches as required; and
- recognizing the specific and differentiated problems and policy characteristics of biodiversity and climate change in process design and application.

Framework approach to climate change: A four step strategy is proposed:

- focus on long-term energy efficiencies which represent the biggest single area for greenhouse gas emissions reduction;
- undertake resource management actions to "offset" emissions, such as reforestation initiatives to increase CO_2 sinks;
- look for cost-effective, "no regrets" measures that are worth doing anyway; and
- prepare for the possibility that new scientific information will require nations to act more quickly.

Framework approach to biodiversity : A quick start approach can be taken by applying appropriate time-space frameworks, giving attention to cumulative effects, and identifying key ecological processes and relationships. In this context, five aspects are important:

- establishing the impact zone and ecosystem context;
- identifying the issues and factors of concern and the ecological objectives for managing them;
- data gathering and understanding baseline conditions;
- identifying biodiversity effects and elements at risk; and
- establishing mitigation objectives and measures.

Folio 7.1:
Functions and Values of the Wadden SEA, Netherlands

Background: The Wadden Sea is an estuarine area partially separated from the North Sea by six barrier islands, seven to 30 km off the northern coastline of the Netherlands. Approximately 50% of the sea is permanently submerged to a depth of 10-40m. The remaining area consists of sand and mud tidal flats and the littoral zone (comprising salt and reed marshes, brackish grasslands and summer polders) which is usually dry except during extreme high tide.

Analysis: Key functions of the Wadden Sea are exemplified below. For many of these functions, a socio-economic value has been estimated. These figures are reportedly conservative; however, they should be treated with caution. In calculating values, net annual revenues were used, minus costs for collecting, transporting and maintaining the good or service (using an estimated or shadow price). The calculation assumes the maximum sustainable use or benefit that can be derived from the natural system, i.e., for types and intensities of use that do not basically alter natural characteristics (which in practice eliminates many carrier and production functions).

- *Regulation functions*:
  - Climate regulation -- tempering influence on weather, may benefit agricultural production.
  - Flood prevention and coastal protection -- valued at US $500/ha/year.
  - Storage and recycling of nutrients -- valued at $2,500/ha/year.
  - Storage and recycling of organic matter -- valued at $2,000/ha/year.

- *Carrier functions*:
  - Recreation (boating, fishing, walking, etc.) -- valued at $500/ha/year
  - Nature protection -- largest, relatively undisturbed area in Netherlands, varied flora and fauna, valuable breeding, feeding and resting area for birds.

- *Production functions*:
  - Food (e.g., fish, mussels, etc.) -- valued at $450/ha/year.

- *Information functions*: (e.g., aesthetics, educational, scientific).

Total economic value of the Dutch Wadden Sea: estimated at $1013/ha/year, for functions which have direct importance for economic production, plus $5,150/ha/year, for conservation or option values using shadow pricing, giving a total annual return of $6,200/ha/year.

Lessons: The functional evaluation of the Dutch Wadden Sea, combining environmental and economic assessments, underlines the socio-economic value and importance of natural areas and indicates the real cost of developing wetlands.

Source: de Groot (1992)

Folio 7.2:
Establishing Carrying Capacities: Integrated Forest Management in New Brunswick, Canada

Background: Under the *New Brunswick Crown Lands and Forest Act* (CLFA, 1980), management plans must demonstrate that timber harvest is sustainable for an 80-year growth cycle and that other land use objectives are met. Plans are renewed every five years for government approval. The first plan (1982) focused primarily on sustainable timber supply; the second (1987) included wildlife and other values; and the most recent (1992) allocated habitat areas to maintain wildlife populations at specified target levels.

Analysis: Typically, habitat management has entered the planning process in the form of constraints to timber allocation and harvesting. Using habitat supply analyses, a proactive landscape-level approach can be taken to address the question of how changes to forest composition and structure will affect wildlife populations. In New Brunswick, habitat availability was predicted under current forest management plans. This exercise indicated, for example, a shortage of mature, conifer-dominated forests, which are preferred or required habitat for a number of birds and mammals. Based on key indicator species (e.g., American Marten), upper and lower habitat thresholds (size and spatial configuration) were simulated. Trial management plans were then developed to determine the associated wood supply costs of meeting these objectives. Final habitat objectives were set at a "safe minimum" standard of 10% of the coniferous-dominated forest on each timber license approximately 3.5 times the level for a viable marten population (e.g., 250 resident adults). This resulted in a reduction in the annual allowable cut of timber.

Lessons: Forest management planning in New Brunswick exemplifies:

- a strategic, landscape-level approach to integrating timber harvesting and wildlife/habitat maintenance;
- the use of the precautionary principle in decision-making, using "best information" available and recognizing the underlying unknowns and uncertainties; and
- the application of GIS-based modeling tools.

Source: Sullivan (1994).

Folio 7.3:
National Sustainable Development Strategies, the Netherlands

Background: The *Dutch National Environmental Policy Plan* (*NEPP*, 1989) represents the most far-reaching sustainability strategy prepared to date. Aptly titled, *To Choose or to Loose*, the initial version was a policy response to a state of the environment report that documented the cumulative risks to human health and constraints on development associated with critical pollution and contaminant loading. Based on this assessment, the NEPP recognized that environmental quality would continue to deteriorate if traditional policies were followed and that radical measures are unavoidable to restore carrying capacity within a generation. The document was updated in 1990 (*NEPP Plus*) and again in 1994.

Analysis: More then 200 measurable actions, including quantified targets and timeframes, are set out in the plan. At all levels, the targets specified involve drastic or sharp emission reductions. In the *NEPP Plus*, additional and accelerated measures are identified for implementing the strategy, including further actions to stabilize CO_2 emissions, e.g., limiting the growth of car traffic, reforestation for carbon sequestering, so as to limit acidification of woodlands, and to decontaminate soil. Further changes are specified to the instruments for coordinating the NEPP with water, nature, and physical planning and a mix of regulatory, fiscal (incentive), and voluntary arrangements are proposed to internalize environmental costs and alter present processes of production and consumption. The latest version of NEPP proposed the introduction of an environmental paragraph or test for policy. Recently, the Director General of Environmental Protection admitted that many of the targets were overly-ambitious and likely would not be reached.

Lessons: The *NEPP*:

- recognizes the Netherlands has reached resource carrying capacity limits that are constraining development;
- provides a comprehensive response to the deteriorated state of the environment;
- includes targets and timeframes for reducing a broad range of emissions; and
- introduces the requirement for an environmental test or paragraph to check that development policies, plans and programmes conform with the objectives and measures set out in the plan.

Sources: Ministry of Housing, Spatial Planning and the Environment (1989, 1992, 1994).

Folio 7.4:
Pulp Mill EA Review Process, Alberta, Canada

Background: In 1988, Alberta-Pacific First Industries Inc. (ALPAC) proposed to build a 1500 ton/day bleached kraft pulp and paper mill. Reportedly the largest of its kind in North America, the mill was to employ new pollution control technology to lower the concentration of chlorinated organic compounds in effluent discharge -- in this case to the Athabasca River, a major tributary of the Mackenzie River Basin (570,00 km^2). The system already had a cluster of pulp and paper mills releasing dioxins, furans, and other compounds at levels in water and fish that were causing public concern. A federal-provincial EA panel was established in 1989 to carry out an independent public review of the ALPAC proposal. The process is of interest because assessment of pulp mill emissions, in terms of toxic loading, cumulative effects, and assimilative capacity, catalyzed the introduction of environmentally superior technology with significant marketing opportunities for the proponent.

Analysis: The Review Board's terms of reference were to examine biophysical impacts relating to air emissions and river discharges, including:

- socio-economic impacts resulting from an increased workforce in the region;
- cumulative effects of existing discharges on the Peace-Athabasca River system, as well as those which would result from the ALPAC and other proposed mills; and
- potential downstream impacts on water quality in the Northwest Territories.

The board was also to investigate and report on the manner in which ALPAC responded to the concerns of local citizens and integrated such concerns into its plans for the mill. Specifically excluded from the Board's terms of reference was an examination of the timber harvesting regime associated with the ALPAC mill, other than that proposed for Indian lands. Many participants in the review process took strong exception to this aspect of the board's mandate.

Public hearings took place over 27 days in late 1989 in different communities; over 5,000 participants attended, 750 written submissions were received; and the transcripts ran to 55 volumes and 7,000 pages. The major issues raised were water quality, site location, and forest management concerns. Also significant were positive economic impacts, e.g., increase in the tax base, and access to jobs. Water quality concerns focused primarily on the release of organochlorines and on the toxicity, to fish and other aquatic life levels, of furans and dioxins downstream from existing bleached kraft pulp mills in Alberta, which were generally in excess of national standards (in some cases significant quantities were found over 1000 Km downstream).

In February 1990, the Board concluded that there were too many uncertainties regarding the cumulative impacts on the river system of the effluent discharges from the proposed and existing pulp mills. It recommended that the construction of the mill not proceed pending further study of the technical feasibility of the proposed new technology and of the entire river system to determine risks and hazards to aquatic ecosystems and downstream users. The Government of Alberta undertook to develop better baseline information within the framework of

the ongoing Northern Rivers Basin Study. An independent assessment of the scientific data contained in the Review Board's report was also undertaken and during this study exercise, ALPAC revised its proposal by structuring a chlorine dioxide bleaching process, further lowering organochlorine emissions by a factor of five.

The scientific and technical review group concluded that the technology would probably meet, if not exceed, stated goals. Construction of the mill then received approval by the provincial government. The federal government provided its approval on the basis that it would be able to follow the results of the baseline study closely and establish, if required, a site-specific regulation pursuant to the Fisheries Act.

Lessons: The review process demonstrated the importance of thorough "scoping" of key issues of involving affected communities and the federal, provincial (Alberta) and territorial (Northwest Territories) governments, and of examining and evaluating new technologies against environmental priorities. The downside of the EA was that as many issues were not foreseen, that the joint initiative was not efficient, and that many delays occurred. Some of the delays can be attributed to the lack of government coordination at various levels, but there was also inadequate public involvement in preliminary proposal development, which might have resolved concerns about project location and design, forest harvesting impacts, and future working arrangements.

A number of evident benefits arose from the EA of the project and particularly, of the proposed technology of the mill before construction. These included:

- inducement to proponents to develop environmentally superior technology;
- means and methods for addressing the issues associated with cumulative effects; and
- procedures, criteria and conditions for future approvals of projects of this type.

At the same time, the difficulties involved in assessing cumulative impacts for this project were substantial. In particular, the assessment of future impacts of a proposed mill were difficult to carry out in an ecosystem in which existing, inefficient facilities had preempted "sink capacities" established by several environmental standards.

Since the mill became operational, several environmentally important results have become apparent:

- the environmental baseline study provides a management framework for future decisions in this ecosystem;
- monitoring has demonstrated that the technology meets objectives; and
- the success of the technology is opening up marketing opportunities for ALPAC.

Source: Ross, 1992; Marbek, 1996.

Folio 7.5:
The Resource Assessment Commission, Australia,

Background: The Resource Assessment Commission (1989-1993) was established in a period characterized by significant controversy between conservation and development interests over mining, forestry and heritage issues. Its mandate was to provide independent advice to governments on implementing ecologically sustainable development (ESD). Although now disbanded, the Commission's experience in conducting thorough, multi-disciplinary public inquiries into complex resource issues is highly relevant and possibly unique.

Principles: Section 7 of the *Resource Assessment Commission Act* (1989), which is still in the statute books, stipulates that the Commission should be guided by three principles:

- There should be an integrated approach to conservation and development by taking both aspects into account at an early stage.
- Resource-use decisions should seek to optimize the net benefits to the community from the nation's resources, having regard to efficiency of resource-use, environmental considerations, ecological integrity and sustainability, ecosystem integrity and sustainability, sustainability of any development, and equitable distribution of the return on resources.
- Commonwealth decisions, policies and management regimes may provide for additional uses that are compatible with the primary purpose values for the area, recognizing that in some cases both conservation and development interests can be accommodated concurrently or sequentially, and, in other cases, choices must be made between alternative uses or combinations of uses.

Approach: The integrated framework developed by the Commission was aimed at assessing the options for resource use and their potential losses and benefits in relation to economic, ecological and social objectives. The approach taken to major inquiries had three major components:

- assessment of the attributes and use of natural resources under review, including their stock and flow characteristics;
- identification of community values, attitudes and preferences for resource use; and
- evaluation of resource-use options and their aggregation and weighting.

The reports of the Commission contained advice on:

- what is known and with what degree of certainty;
- the nature and extent of disagreements about important issues; and
- the pros and cons of particular courses of action leaving the final selection to Government.

Methods Applied in the Kakadu Conservation Zone Inquiry: This focused particularly on the Coronation Hill mining proposal. It employed a range of assessment and evaluation techniques to establish a loss-benefit frame of reference on a highly controversial issue of resource development and conservation. As such, the approach exemplifies how a full cost sustainability

analysis might be undertaken as part of or in addition to EIA. Key methods and techniques used included:

- environmental baseline and resource inventory;
- recreation opportunity spectrum mapping of Kakadu National Park and the Conservation Zone;
- contingency evaluation to derive monetary estimates of environmental and recreational values (which proved methodologically controversial);
- input-output modeling to estimate the significance of the mine to the regional economy;
- cost-benefit analysis to assess national economic significance of the mining proposal;
- social impact assessment to assess the effects of development for local Aboriginal communities;
- quantitative risk assessment of major accidents and spills; and
- scenario analysis and modeling to examine consequences of residue dam failure.

Source: Resource Assessment Commission, 1991; Palmer, 1992.

Folio 7.6:
EIS New World Mine Project,
Greater Yellowstone Bio-Region, United States

Background. Noranda, Inc., a Canadian corporation, is proposing to build a major gold mine four km from the northeastern corner of Yellowstone National Park. Located in high-altitude mountain terrain, the mine site is surrounded on three sides by designated wilderness areas. The site encompasses three Yellowstone River watersheds, including a creek draining directly into the National Park and another draining into the Clarks Fork of the Yellowstone River, Wyoming's only wild and scenic river. An EIS of the development is currently under preparation.

Analysis: Yellowstone is the first national park established in the world. Known primarily for its volcanic features, the park is the core area of one of the last large natural ecosystems in the lower 48 states. Given the location, the scale and type of development proposed is of major concern to park officials and conservationists.

The key impacts and risks of the mine relate to:

- seepage of toxic pollutants directly into water systems;
- long-term safety and liability (the mine site is in an area prone to earthquakes and avalanches);
- displacement of rare high-elevation wetlands;
- interference with wildlife habitat, including the threatened grizzly bear; and
- establishment of an industrial precedent next to a protected area and tourism-dependent region.

Lessons: The New World Mine proposal from a sustainability perspective, appears as a classic candidate for:

- application of the strict precautionary principle -- per Figure 7.3; and
- full cost analysis based on "safe minimum standards requirement" to determine impact acceptability.

Source: Information supplied by Greater Yellowstone Coalition; US CEQ.

Folio 7.7:
Review of Tourist Resort Proposal by the Natural Resources Conservation Board, Alberta, Canada.

Background: In 1993, the Natural Resources Conservation Board (NRCB) of Alberta reviewed a proposed tourist resort development in the West Castle Valley, in the Canadian Rocky Mountains. The project involved the extension of a small ski facility into a year-round resort with two golf courses, accommodation for 2500 people and supporting infrastructure. The location was adjacent to Waterton Lakes National Park which, together with the adjoining Glacier National Park in Montana, is a UNESCO World Heritage Site. The review of the EIS by the Board involved quasi-judicial public hearings that took approximately one month and produced 5000 pages of testimony. The Board was to determine whether or not the project was in the public interest, and was to include consideration of social, economic and environmental impacts, which in this case were placed in the context of an ecosystem approach to sustainable development.

Analysis: Proponents emphasized the economic benefits of the project, pointing out that the area was currently in use for recreational purpose and that additional development would not have significant adverse effects with the mitigation measures proposed. In contrast, many intervenors expressed concern about the impact of the development on wildlife habitat and key species of the valley and the surrounding "Crown of the Continent Ecosystem" (e.g., including grizzly and black bears, cougar, lynx, deer, elk, moose and other mammals). The Board decided the development was in the public interest. But it also attached important conditions based on an ecosystem analysis and sustainability considerations.

- *Ecosystem Approach:* The Board reviewed the environmental impacts of the proposal at three distinct levels: the site footprint of development, the habitat requirements for large mammals potentially affected and the regional ecosystem.

- *Sustainable Development*: The Board made an explicit attempt to balance the long-term environmental, social and economic effects of the proposal in keeping with the principles of sustainable development. Noting the importance of environmental quality in maintaining the tourism base, the Board recommended land use controls for this purpose and the establishment of a community-based commission to oversee their implementation.

Lessons: The NRCB review of the West Castle proposal:

- incorporated a multi-level assessment of environmental impacts based on an ecosystem approach to sustainable development;
- explicitly applied the precautionary principle to address trans-boundary and cumulative effects; and
- identified the importance of a strategic plan for long term ecosystem protection backed by land use controls overseen by a community-based commission for sustainable management of the recreation area.

Source: Doyle *et al.*, 1996.

Folio 7.8:
An Ecosystem Approach to Cumulative and Large-Scale Effects -- the International Joint Commission Reference on Great Lakes Diversions and Uses, Canada and the USA

Background: The goal of the Great Lakes Water Quality Agreement (1978) between Canada and the United States is to restore and maintain the chemical, physical, and biological integrity of the "inland seas" of North America. An ecosystem approach is identified as the basis for the cooperative management of the basin (530,000 Km^2). Under the agreement, the International Joint Commission (IJC), a standing body established by an earlier treaty, is assigned responsibilities for monitoring implementation. It is also given "references" to investigate issues of mutual concern to both countries.

Analysis: In 1985, the Commission responded to a reference on Great Lakes Diversions and Consumptive Uses, principally by reviewing the physical and engineering aspects of controlling flow levels. Secondarily, the longer term, basin-wide prospects for water use and allocation were addressed. This component of the study incorporated elements of SEA in general, and contributed to the articulation of an ecosystem approach. Aspects considered included:

- projected increases in demand for water uses that are significant enough to warrant early action;
- proposed small-scale inter-basin diversions with potential cumulative impacts;
- long-term climatic changes that may have a significant effect on water supply and demand; and
- major structural changes in economic and social conditions, e.g., resulting from world/continental population; and food supply trends that may lead to renewed interest in large scale inter-basin transfers.

The Commission concluded that possible effects of discontinuities, such as climate change, suggest a non-linear approach to planning, one that is more adaptive and responsive to societal values.

Lessons: The IJC's report (1985):

- exemplified an "anticipate and prevent" approach to resource management;
- considered the interrelationship of water use in a basin-wide, ecological context, stressing the "other than economic" importance of the system; and
- urged both governments to foster institutional adaptiveness, noting that present arrangements are not designed to respond quickly to new situations.

Source: International Joint Commission, 1985 Great Lakes Diversions and Consumptive Uses. A Report to the Governments of the United States and Canada Under the 1977 Reference.

Folio 7.9:
Nature Conservancy Project on Great Lakes Biodiversity, Canada and USA

Background: In a study of features within the Great Lakes basin, the Nature Conservancy identified 131 elements that were either critically imperiled (22), imperiled (30) or rare (79) on a global scale. Globally significant elements include 31 natural community types, 49 plants, 21 insects, 12 mollusks, nine fish, five birds, three reptiles and one mammal. Nearly half (61) occur exclusively or predominantly in the basin, or have some of their best examples in the basin.

Analysis: Key biodiversity characteristics of the basin include:

- one of the largest sand dune systems in the world, characterized by unique plant and animal adaptations to the environment, with several new species and varieties;
- several fish species of global significance including a recently-evolved complex of deepwater fish known as ciscoes;
- extensive freshwater marshes with dependent ecological dynamics and species composition;
- some of the continent's last and best examples of imperiled savanna communities on the southern lakeplans; and
- communities of arctic and prairie species that persist from the glacial period in an open bedrock landscape which remain intact in only a few places.

Lessons: Major threats to biodiversity include: agricultural practices, air emissions, land development, exotic species, in-place pollutants, mining, solid waste disposal, recreation, the management of living resources, water discharges, and the control of water levels.

Biodiversity protection in the Great Lakes ecosystem requires: a strategic focus on the most threatened and most important components, concentrating efforts on those stresses than negatively impact the most biodiversity, and developing a toolbox of conservation techniques and strategies that are tailored to regional conservation needs and challenges.

Source: Rankin and Crispin, 1994.

Folio 7.10:
Programmatic EIS For Bridge Crossings On The US-Mexico Rio Grande Border

The US Department of State is undertaking a study to address the cumulative impacts of Rio Grande bridge crossings which have already been issued Presidential Permits. The PEIS will analyze the unique features of the Rio Grande river basin, identify biodiversity "hot spots", and develop a core of information on air and water quality, socio-economic and cultural resources. The PEIS involves extensive coordination among local, state, and federal agencies, and with governments in Mexico.

- Today, 23 bridges (including two railroad crossings), two dams and one ferry cross the 2,000-km international border along the Rio Grande river between El Paso and the Gulf of Mexico. An estimated 80 percent of this construction has occurred or is anticipated to occur in the lower and middle portions of the Rio Grande, from Del Rio south to the Gulf.

- The Rio Grande Valley is one of the most biologically diverse and environmentally sensitive areas in the continental United States. The Lower Rio Grande Valley contains more species of plants and animals than any comparable area within the US (including an estimated 100 at-risk species), and is the northernmost site for many species of tropical migratory birds.

- Increasing interest in this unique ecology highlights the need for sustainable economic and social development of the river basin. This can best be achieved through binational cooperation in the gathering and interpretation of socio-economic, geographic and environmental data, and the development of common goals for biodiversity conservation.

Source: US EPA public communications materials.

CHAPTER 8:
A WAY FORWARD:
CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the main conclusions of the study, and presents recommendations for improving EA processes and standards of practice. The discussion is organized in three parts focusing on:

- *an agenda for action* in response to the contemporary challenges and opportunities of EA as documented in previous chapters;
- *future directions for EA* as indicated by longer term, societal trends, and external factors to which EA must adapt to stay relevant in the new century; and
- *a sign-off on the effectiveness study,* comprising last words on the lessons and experience gained during the last two years.

EA has come far in the last 25 years, EA has come far. It has moved from a unique innovation to standard practice in many countries, international organizations, and private companies. The EA process today functions as one of the primary instruments for taking account of environmental consequences in development planning and decision making. Much is gained by the use of assessment, including important spin-off benefits such as policy and institutional adjustments, technological innovation, and community development. Equally, however, there is much still to be done to upgrade the effectiveness of EA as a tool for sustainable development.

8.1 Agenda for Action

In this section, a package of options and measures is described for strengthening EA in support of sustainability planning and decision making. This approach is organized as a series of building blocks, beginning with basic requirements and leading toward farther-reaching extensions of the EA process. As such, the agenda can be read both as an overall strategy and as a menu of options from which participating and interested agencies can select aspects relevant to their stage of development and current interests. For each component, a brief statement of what works well and what needs work, summarizing results reported earlier, provides the context for discussion and points to research and development requirements.

A five-part agenda is proposed to cover the following interrelated components of process development:

- going back to basics;
- upgrading the project EIA process and activities;
- extending SEA to become an integral part of development policy-making;
- sharpening EA (EIA+SEA) as a sustainability instrument; and
- exploring "new" opportunities and challenges for EA.

8.1.1 *Going Back to Basics*

What works well

The institutional foundations of EA, its laws, principles, and arrangements, are acknowledged as being reasonably well-founded, recognizing that recent steps have been taken toward strengthening many national and international systems. Basic provisions and requirements for effective performance are widely recognized, e.g., clear, legal mandate, appropriate scope of applications, transparency of process, and provision for public involvement. In general, these do not and should not present real concern except for those developing countries where resource and other constraints require capacity building in support of process development.

What needs work

A number of basic requirements still require attention. These include:

- better procedural and good practice guidance (which many survey respondents and others recognize as wanting);
- explicit timelines and certainty of process implementation (which remains a major concern of business and industry);
- resolution of duplication and overlap in cases where the EA process involves two or more governments; and
- in some cases, clear specification of the relationship of EA to decision making .

Emerging challenges

Generally, the above requirements appear to be fairly straightforward. It seems unlikely that research can help, other than to document case examples of where and how sound guidance and process efficiencies are secured in countries and organizations. Further substantive challenges involve:

- establishing standards for quality performance in EA, initially by:
    - codifying international guidelines, principles, and standards of good practice;
    - relating these to ecosystem conditions and characteristics, and to sectoral applications by industry and government; and
- taking this initiative forward either as a separate exercise by EA professionals (e.g., IAIA, UNEP) or, possibly, as part of environmental management systems certification (e.g., ISO 14000 series).

8.1.2 Upgrading EIA Processes and Activities

What works well

As seen by practitioners, most steps and activities of the EIA process are generally performed satisfactorily or better. The "3r's" of *rigorous* analysis, *responsive* consultation, and *responsible* administration are standard principles in well-established EIA systems. Equally, the process is recognized as addressing a range of considerations and providing clear, consequential information for decision making. Impact mitigation is a competently applied, and possibly undervalued, means of giving practical focus to assessment and linking it directly to environmental protection benefits.

What needs work

Key areas that require attention include:

- building quality control mechanisms in the post-decision EIA process, (e.g., monitoring and follow-up);
- strengthening the weaker links in the pre-decision EIA process, (e.g., scoping);
- closer integration of environmental, with social, health and other impacts;
- tailoring public involvement to the issues and parties involved;
- communicating the results of EA to decision makers, and the public in clear, user-friendly language; and
- practical frameworks and methods to address cumulative effects and large scale changes.

Emerging challenges

As far as possible, further work on the above should emphasize integrated pilot studies that illustrate and compare application of "good practice" guidance in leading jurisdictions. Priorities include:

- *quality control in EIA* -- a "whole process" review of key mechanisms and relationships, with a particular reference to how these can be applied cost-effectively from screening to post-project analysis;
- *public involvement* -- trial testing of new modes of public consultation and input as part of the EIA process, including negotiated scoping, round tables or focus groups to cross-reference environmental and socio-economic impacts, and self-prepared community impact statements; and
- *cumulative effects and large-scale changes* -- documenting case experience (success stories) on how these issues can be addressed, institutionally and methodologically, at the project (as compared to the strategic) level. This approach will be critical in making procedural guidance credible and applicable.

8.1.3 *Extending SEA as an Integral Part of Policy Making*

What works well

Although still at a relatively early stage of development, SEA is used to effective purpose in a number of jurisdictions. In particular, the process has been successfully applied to development plans and programmes that contain physical and locational components and initiate projects and concrete activities. With certain modifications, EIA-based methods and procedures are widely used at this level and evident benefits are gained by strategic evaluation and comparison of alternatives and by early mitigation of plan and programme effects. More extensive adjustments occur at the policy level, including the use of separate administrative-based procedures and environmental appraisal frameworks. There are important examples of how decisions have been improved, but, generally speaking, the picture of what works well is less clear at this level.

What needs work

SEA is an emerging process, and many issues need attention. The following stand out as particular requirements:

- developing flexible, "fit for purpose" approaches that can be related to the varied configurations of policy making;
- use of appropriate easy-to-apply methods and procedures (avoiding the methodological over-elaboration that sometimes occurs at strategic levels);
- provisions and opportunities for public involvement, especially in policy-level SEAs;
- addressing cumulative and large scale effects in SEAs;
- quality information for decision making at this level, including the extent to which trade-offs can or should be clarified; and
- arrangements for tracking the results of "SEA decisions" including relating these to ongoing requirements for project EIA and other processes.

Emerging challenges

SEA appears to be a growth area for future work, e.g., as identified by European EIA Centres. High priority concerns for practitioners and administrators include:

- *policy-level assessment* -- briefing materials and advisories that give a clear understanding of operational regimes, useful methods, and procedures at this level, and measures for communicating results and benefits to decision makers and their advisors;
- *extended applications* -- pilot or demonstration studies of practical ways of applying an environmental "test" to fiscal and budget decisions, macro-economic policies and international lending and assistance; and
- *alternative approaches* -- a reconsideration of the relationship of SEA and other policy tools, including practical opportunities for instituting more integrative, sustainability-oriented analysis.

8.1.4 Sharpening EA as a Sustainability Instrument

What works well

EIA and SEA function already as tools for addressing sustainability. By definition, they incorporate environmental and related social and economic considerations into the mainstream of decision making. The approach taken in EA also conforms to the sustainability principles and prerequisites for integrated decision making as identified in the Brundtland Report and Agenda 21. Of particular note is a twenty-year record of experience in identifying and mitigating environmental damages, consulting with the interested and affected public on these matters, and providing decision makers with information on the likely consequences of proposed actions.

What needs work

A range of actions can be undertaken to sharpen EA as a tool for sustainability assurance. These can be applied to improve standards gradually or as part of a comprehensive redirection of process. Basic steps could include:

- further guidance on the use of sustainability concepts and principles in EA (e.g., taking account of biodiversity considerations);
- incorporating relevant criteria and indicators into screening, significance, and other checklists (e.g., related to loss of habitat, ecological, and wetland functions);
- refocusing on environmental bottom lines (e.g., by specifying precautionary based thresholds, capacities, and "rules of thumb"); and
- specifying requirements for in-kind compensation for residual impacts.

Emerging challenges

Ultimately, the effective deployment of EA in support of sustainable development can only be achieved as part of larger policy and institutional reforms to decision making. In the interim, more integrated approaches can be promoted by:

- developing practical frameworks for applying "best estimate" impact science, e.g., to:
  - address uncertainty;
  - avoid irreversibility;
  - keep risks "as low as reasonably practicable"; and
  - link ecological functions and socio-economic values;

- establishing better modes of integration of EIA and other forms of impact assessment, e.g.,:
  - cross-impact matrices;
  - information technologies; and
  - decision-aid (expert) systems;

- identifying options for structural integration of EA (EIA+ SEA) with other policy instruments, e.g.,:
  - environmental accounting/state of environment reporting;
  - sustainability strategies;
  - land and resource use planning; and

- undertaking pilot studies of the practical application of ecosystem approaches to establish "best guess" estimates of carrying capacity, critical ecological functions and thresholds, and natural capital stocks.

8.1.5 New Opportunities and Challenges for EA

The basis of "new" applications in EA is established already by prevailing trends in practice. Important areas for extending the use of assessments include:

- large-scale cumulative effects and transboundary management of common property resources, (e.g., contamination of Mediterranean Sea, circumpolar Arctic and Great Lakes);
- global change issues in addition to biodiversity and climate warming;
- international trade and assistance;
- investment and financial reform packages (e.g., structural adjustment funds);
- environmental liability and insurance decisions (e.g., site, facility, and property assurance);
- rehabilitation, remediation, and restoration of contaminated sites and degraded lands;
- decommissioning or replacement of large scale infrastructure (e.g., Brent Spar);
- life cycle analysis of industrial production process (e.g., closing pollution-emission loops);
- land conversions from lower to higher intensity uses (as a critical indicator of natural capital loss or deterioration); and
- integration of habitat and green space into development patterns (to achieve the 12% set-aside which is widely agreed as a "rule of thumb" for maintaining ecological functions for large scale systems).

In addition, there is a set of challenges that calls for more extended approaches to EA. Challenges include both immediate and longer term innovations as follows:

- *practitioner-supported capacity building* to meet the needs of developing countries for "hands-on" training, "on the job" institution strengthening and "on call" support networks (all of which were identified as critical deficiencies in existing approaches to capacity development by study participants from developing countries);

- *advancing EA as a knowledge-based industry* that is
  - based on and extends information tools and technologies;
  - applies analytical and consultation-based skills, and methodologies; and
  - represents a source of problem-solving experience with wide application in the 21st Century;

- *moving beyond EIA and SEA to sustainability assessment and planning,* focusing on:
  - integrated policy making
  - regional assessment in support of land use planning and the ecosystem approach; and
  - project review (environmental, economic, and social) as a basis for negotiating sustainable development packages and offsets; and

- d*iversifying EA to make it widely applicable,* notably for use by:
  - small and medium enterprises;
  - local governments and municipal authorities;
  - individual householders and consumers, e.g., "do it yourself" checklists to assess daily impacts on the environment, identify options for change

8.2 Future Directions For EA

The world in which EA operates today is very different from the one in which the process was introduced. Undoubtedly, the world in which EA will operate 25 years from now will be as different again. The challenge is to stimulate "policy thinking" and discussion about how to sharpen and position EA as a sustainability mechanism for the 21st Century, consistent with the findings and directions outlined previously. A strategic framework of possible directions for EA in the near and intermediate future can serve a number of purposes. In business planning, for example, corporations undertake such exercises to stay competitive in a changing environment, to try and anticipate risks and impacts and their operational consequences, and to help direct investment, research and development, and other activities. Future possibilities for the application of EA are reviewed for two time frames:

- *near term* -- as indicated by broader societal trends; and
- *long term* -- as projected by resource use and environmental quality scenarios.

8.2.1 Near-term Trends

Emerging policy and institutional realities and broad societal changes are quickly reshaping the world in which EA operates. At the global scale, especially, major changes are taking place in social, economic, and political systems, and in relationships among people and between people and natural systems. These broad, structural, world-wide changes or "mega-trends", such as globalization and privatization, converge and reinforce each other, often along the "electronic highway" of information and investment flows. While still being played out and open to different interpretation, these shifts clearly call for new modes of governance and of conducting business. In turn, they carry profound implications for EA practice in the near term.

Future challenges and opportunities appear to be set for EA by the following "big picture" trends:

- *globalization* -- the integration of the world market place likely will bring increasing pressure on natural resources, possibly signaling the need for international EA standards;

- *deregulation* -- reducing the role of the public sector promises to accelerate the shift from "command and control" to "monitor and spot check" approaches and may also increase emphasis on policy assessment;

- *privatization* -- selling off utilities/operations that were formerly government-owned could reinforce the need for nationally/internationally agreed EA standards;

- *downsizing of government* -- the requirement to "do more with less" points to a decentralization of EA responsibilities from national to local authorities, business, and industry and even to individual consumers, all of which may call for new modes of guidance and monitoring; and

- *cost recovery* -- having proponents pay for EA as a consequence of downsizing seems likely to bring increased pressures for process efficiency and fast-track approaches and methodologies.

8.2.2 Long-term Trends

Looking further ahead to where EA should or might go, the reference point is *sustainability of development*. Three questions are important here: where current rates and patterns of population and economic growth are leading us; what their likely impacts will be on natural systems and cycles in the reasonably foreseeable future; and how broadly-based assessments might serve as "early warning tools" to inform policy makers of the option to and consequences of continuing down present paths of "throughput" growth. In this regard, using broad-based scenarios of change to map "alternative futures" provides an instructive means of "focused speculation" about future directions for EA and environmental management in an era of possible resource constraints. The global model of resource and pollution flows used by Meadows *et al* (1992) provides a frame of reference for this purpose.

The World3 model (an upgraded version of the Club of Rome limits model) simulates 14 "state of the world" scenarios. In all cases, because of the mathematics of exponential growth, the next twenty five years appears as the critical time window that will make a difference between achieving a "systems equilibrium" and possibly overshooting resource and environmental thresholds. While not predictions or forecasts, the scenarios illustrates the short time window that may remain for making choices. They constitute an urgent warning of the importance of starting down what the reconvened World Commission on Environment and Development (1992) called unavoidable policy paths toward more sustainable forms of development.

Large-scale EAs may be envisaged as helping to guide decisions and check on progress, much as EIA is now routinely used for project design and planning. At global (and national) scales, the environmental impact of human activity can be summarized by a simple identity: I = PAT [Impact = Population (numbers) x Affluence (per capita resource consumption) x Technology (pollution per unit of energy or material output)]. The IPAT "formula" indicates the future importance and possible scope of use of EA and related processes to check and clarify policy directions and options. "Big picture" EAs, for example, could focus on:

- the *impact* side of the IPAT relationship by "mapping" the ecological footprint of human activity at the scale of countries, cities or individual buildings;
- the *population* component by reviewing national or regional carrying capacities;
- the *affluence or lifestyle* component by full cost assessments of private car ownership, suburban housing etc; and
- the *technology* component by life cycle analysis to identify and optimize energy inputs, waste outputs, and pollution loops (the industry ecosystem model).

8.3 Sign Off on the Effectiveness Study

The future is not preordained; it is what we make of it. Assessment as a process of bringing together environment and development considerations is one of the tools needed by a sustainable society. Sharpening these tools, making them more effective, and applying them to positive purpose is an ongoing activity. This process of innovation, now extending over 25 years, is taken forward by numerous adaptations and changes. From this standpoint, the best a study of EA effectiveness can hope to accomplish is to serve as a catalyst to further thinking and activity. Whether this is the case here is left to others to judge.

In signing off on the effectiveness study, there are lessons regarding the process of collaboration that are worth restating. Some of the practical dividends that have come from the effectiveness study include:

- understanding developments in other jurisdictions;
- exchanging experiences around a series of working themes; and
- adding and gaining value from the interaction with other practitioners.

While the effectiveness study itself concluded at Lisbon in IAIA '96, the network of contacts and exchange of ideas, information and tools should continue. This can occur at a number of formal and informal levels; for example, by making operational the EA managers network, as discussed at the First International EA Summit in 1994. It is also recommended that the study's partner countries and organizations continue to meet as an informal group, using the annual IAIA Conferences to organize working forums on issues of common interest. Other agencies and organizations should be welcome on an "as interested" basis.

The task of improving EA effectiveness has no monopolies of expertise; it is a common product that is never finished. The present study will have been worthwhile if there is enough here to begin.

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